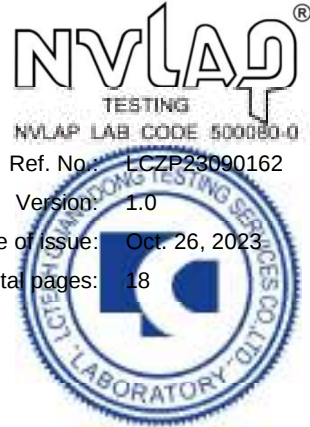




Test report of

IES LM-79-08

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

Rendered to:

Beyond LED Technology

1939 Parker Court, Stone Mountain, GA 30087

For products:

2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces

Models No.:

BLT-BL22-S72-3065

Oct. 12, 2023 to Oct. 17, 2023

Test Date: **LCTECH Guangdong Testing Services Co., Ltd.**

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

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

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

Test Note: N/A

Compiled by:

Pengkang Liang

Oct. 26, 2023

Reviewed by:

Lin Qiu

Oct. 26, 2023

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Table of Contents

1. General	3
1.1 Product Information	3
1.2 Standards or methods	4
1.3 Equipment list	4
2. Test conducted and method	5
2.1 Ambient Condition	5
2.2 Power Supply Characteristics	5
2.3 Seasoning and Stabilization	5
2.4 Electrical Instrumentation	5
2.5 Color Measurement Method	5
2.6 Total Luminous Flux Measurement Method	5
2.7 Luminous Intensity Distribution Measurement Method	5
2.8 Spatial Non-uniformity of Chromaticity	5
3. Test Result Summary	6
3.1 Electrical data	6
3.2 Photometric data	6
3.3 Electrical data on 277V	7
3.4 Color Rendering Details	7
4. Test Data	8
4.1 ANSI Chromaticity Quadrangles Diagram	8
4.2 ANSI/IES TM-30-18 Color Rendition	9
4.3 Goniometry Test Data of 3000K	14
4.4 Zonal Lumen Summary of 3000K	14
4.5 Polar Curves of 3000K	15
4.6 UGR Table of 3000K	16
4.7 Candela Tabulation of 3000K	17
Appendix A Product Photo	18



1. General

1.1 Product Information

Brand Name	Beyond LED Technology
Category	Indoor
General Application	Troffer
Primary Use	2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces
Model Number	BLT-BL22-S72-3065
Rated Inputs	AC120-277V, 50/60Hz
Rated Power	20W,25W,30W,35W,40W
Rated Light output	2600lm,3250lm,3900lm,4550lm,5200lm
Declared CCT	3000K/3500K/4000K/5000K/6500K
Power Supply	ZS-FS40-680-5
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.	230920101001
Date of Receipt Samples	Sep. 20, 2023
Note	This is a color tunable and multi-power product, 3000K, 3500K, 4000K, 5000K and 6500K at 40W 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	120.03 V ~60Hz	120.03 V ~60Hz	120.02 V ~60Hz	120.03 V ~60Hz	120.02 V ~60Hz
Input Current(A)	0.334	0.336	0.334	0.331	0.335
Total Power(W)	39.76	39.99	39.84	39.46	39.87
Power Factor	0.993	0.993	0.993	0.993	0.993
I-THD	8.81%	8.80%	8.68%	8.85%	8.71%
Off-state Power(W)	-	-	-	-	-

3.2 Photometric data

Criteria Item	Result				
	3000K	3500K	4000K	5000K	6500K
Total Lumens(lm)	5461.15	5544.00	5775.41	5861.42	5630.73
Luminaire Efficacy(lm/W)	137.35	138.63	144.97	148.54	141.23
Correlated Color Temperature (CCT)(K)	3027	3363	3864	4911	6450
Color Rendering Index (CRI)	83	85	86	84	82
R ₉	8	14	21	13	5
R _f	85	86	86	83	82
R _g	97	97	98	98	97
R _{cs,h1}	-11%	-11%	-10%	-11%	-13%
Chromaticity Coordinate (x,y)	0.4337	0.4125	0.3850	0.3475	0.3142
	0.4006	0.3928	0.3750	0.3523	0.3254
Chromaticity Coordinate (u',v')	0.2500	0.2395	0.2288	0.2128	0.2002
	0.5195	0.5132	0.5015	0.4854	0.4666
Duv	-0.0010	-0.0006	-0.0021	-0.0006	0.0006
Zone Lumens between 0-60°	89.20%	-	-	-	-
Spacing Criteria (0-180)	1.98	-	-	-	-
Spacing Criteria (90-270)	1.98	-	-	-	-
Maximum UGR ¹	18.8	-	-	-	-

Note:

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



3.3 Electrical data on 277V

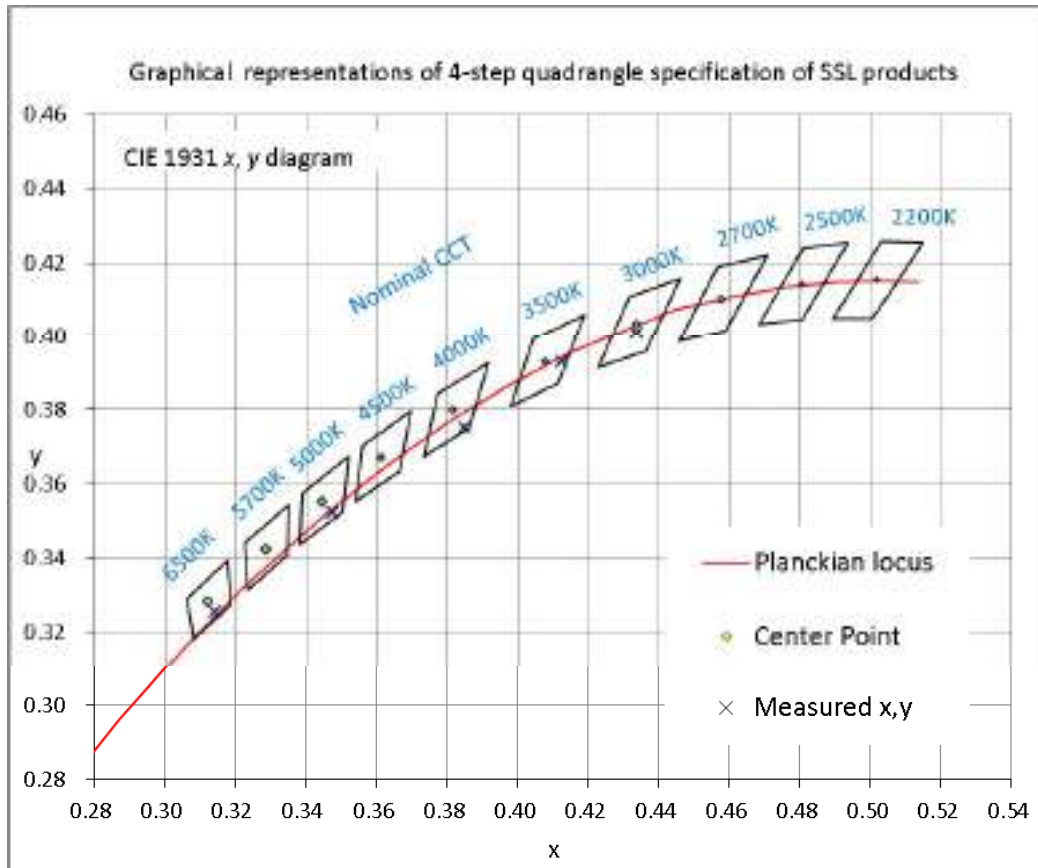
Criteria Item	Result				
	3000K	3500K	4000K	5000K	6500K
Input Voltage & Frequency	277.03 V ~60Hz	277.02 V ~60Hz	276.97 V ~60Hz	277.03 V ~60Hz	277.03 V ~60Hz
Power Factor	0.940	0.940	0.939	0.939	0.940
I-THD	11.70 %	11.53%	11.62%	11.75 %	11.66 %

3.4 Color Rendering Details

3000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
81	91	96	81	82	89	83	59	8	80	81	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	71	85	98	76
4000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
85	91	95	86	85	87	87	69	21	78	86	69	86	97	79
5000K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
82	88	91	84	83	83	88	70	13	70	84	61	84	95	78
6500K														
R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
81	85	87	84	83	80	86	70	5	64	84	61	82	93	76

4. Test Data

4.1 ANSI Chromaticity Quadrangles Diagram



4.2 ANSI/IES TM-30-18 Color Rendition

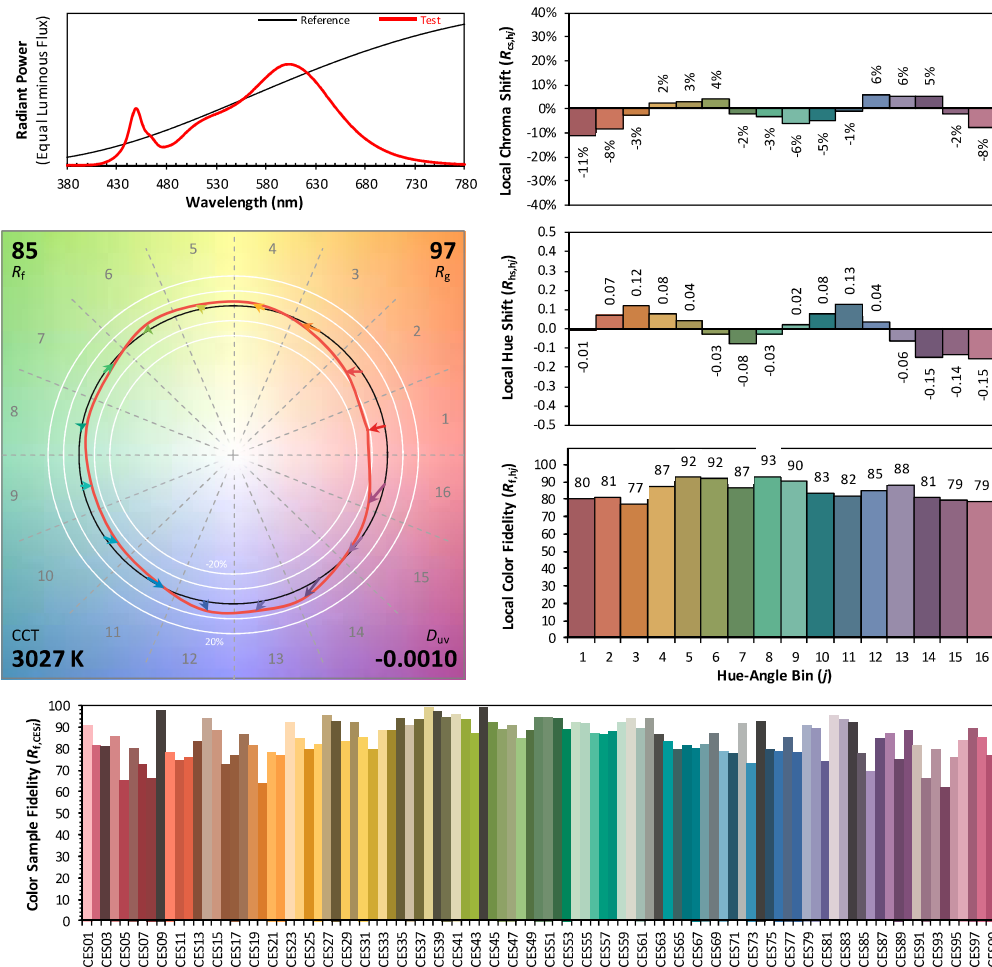
ANSI/IES TM-30-18 Color Rendition Report

Source: SPD

Manufacturer: Huizhou Zenith Technology Co Ltd

Date: 2023/10/26

Model: ZS-BL2*2-S40-3065 (3000K)



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

x 0.4337
 y 0.4006
 u' 0.2500
 v' 0.5195

CIE 13.3-1995
 (CRI)
 R_a 83
 R_9 8

Note:

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



Page 10 of 18
ANSI/IES TM-30-18 Color Rendition Report

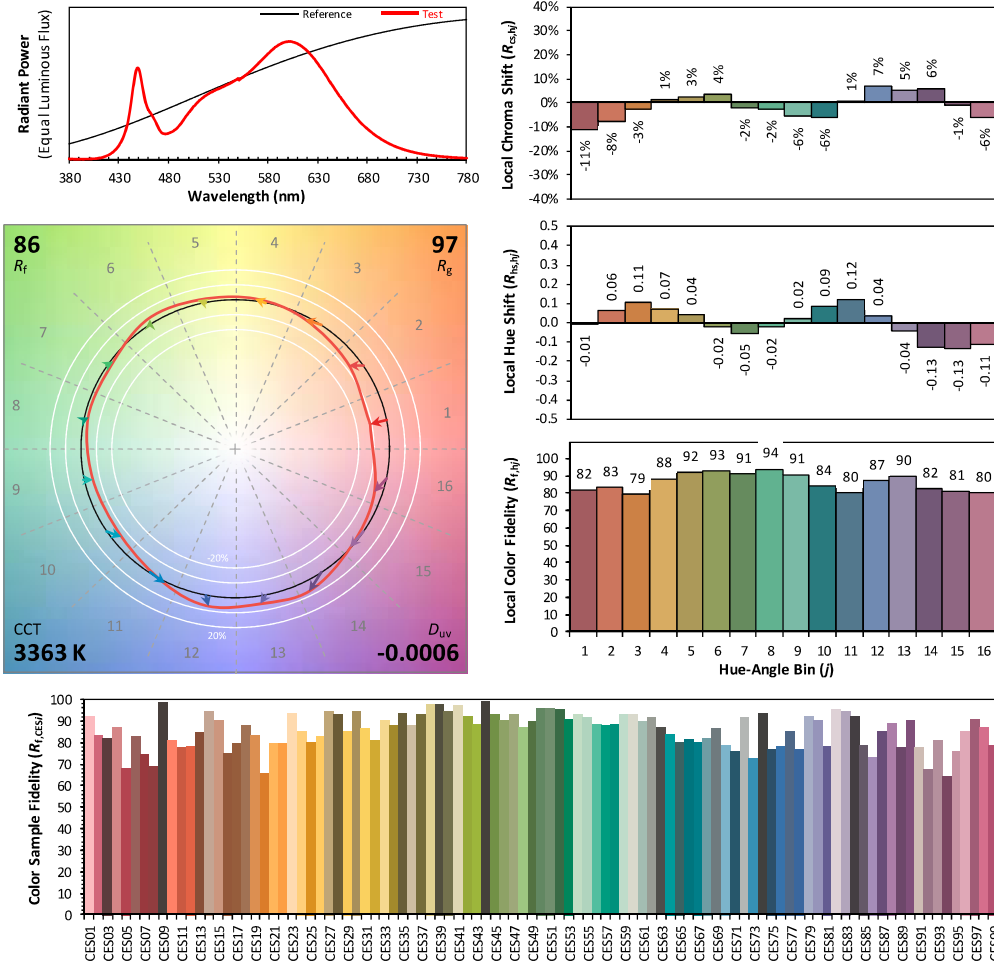
Ref. No.: LCZP23090162, V1.0

Source: SPD

Manufacturer: Huizhou Zenith Technology Co Ltd

Date: 2023/10/26

Model: ZS-BL2*2-S40-3065 (3500K)



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

x 0.4125
 y 0.3928
 u' 0.2395
 v' 0.5132

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.



Page 11 of 18
ANSI/IES TM-30-18 Color Rendition Report

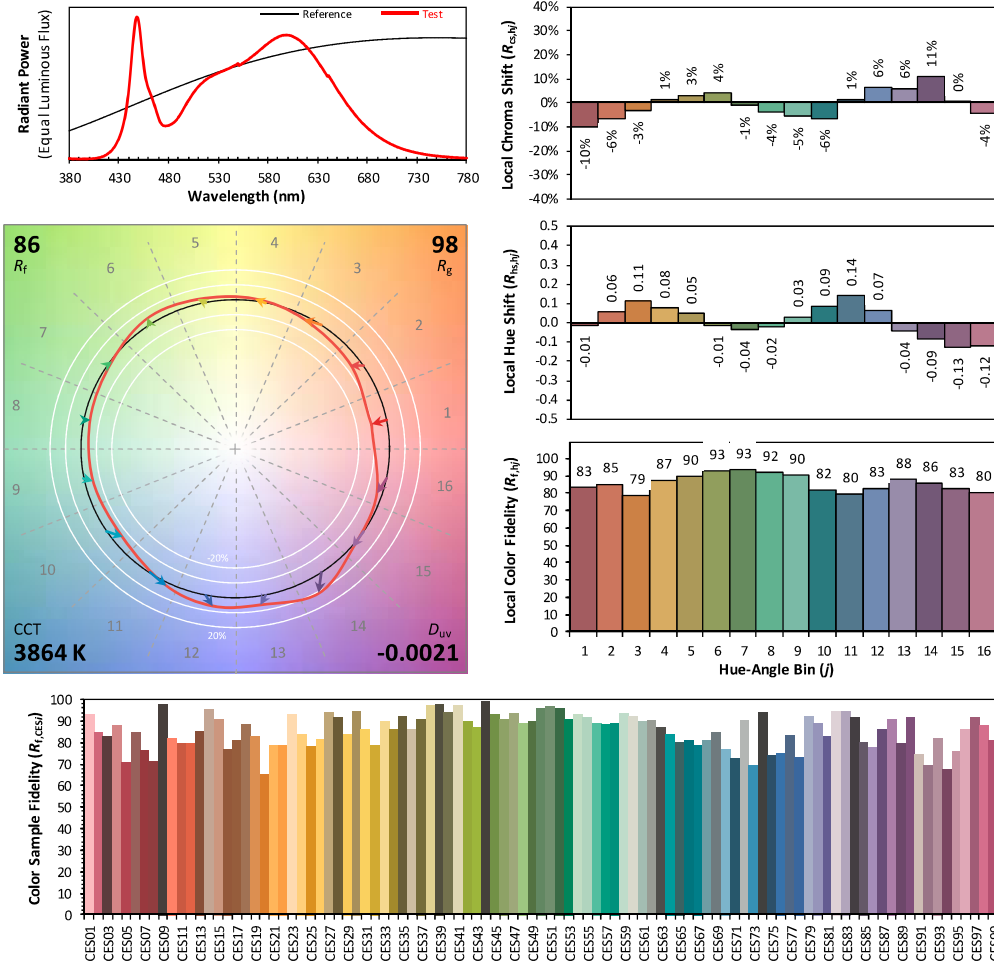
Ref. No.: LCZP23090162, V1.0

Source: SPD

Manufacturer: Huizhou Zenith Technology Co Ltd

Date: 2023/10/26

Model: ZS-BL2*2-S40-3065 (4000K)



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

x 0.3850
 y 0.3750
 u' 0.2288
 v' 0.5015

CIE 13.3-1995
(CRI)

R_a 86
 R_g 21

Note:

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



Page 12 of 18
ANSI/IES TM-30-18 Color Rendition Report

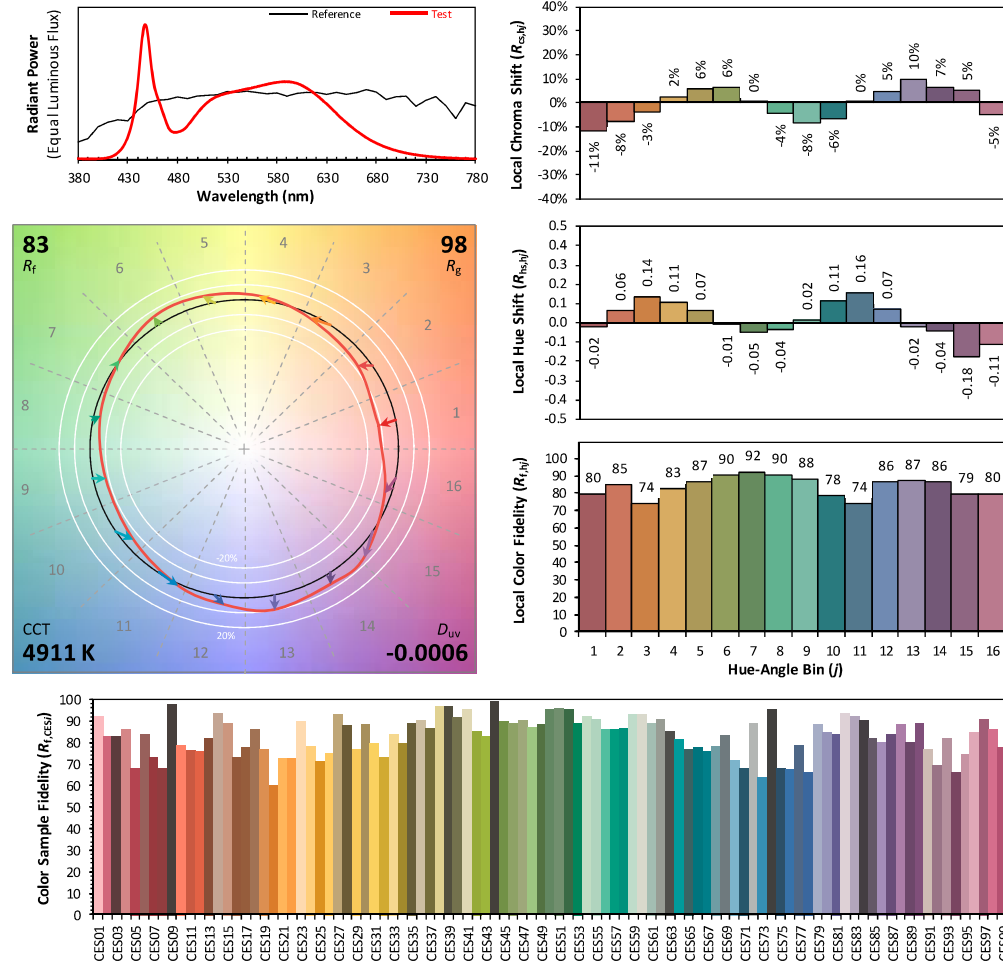
Ref. No.: LCZP23090162, V1.0

Source: SPD

Manufacturer: Huizhou Zenith Technology Co Ltd

Date: 2023/10/26

Model: ZS-BL2*2-S40-3065 (5000K)



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

x 0.3475
 y 0.3523
 u' 0.2128
 v' 0.4854

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.



Page 13 of 18
ANSI/IES TM-30-18 Color Rendition Report

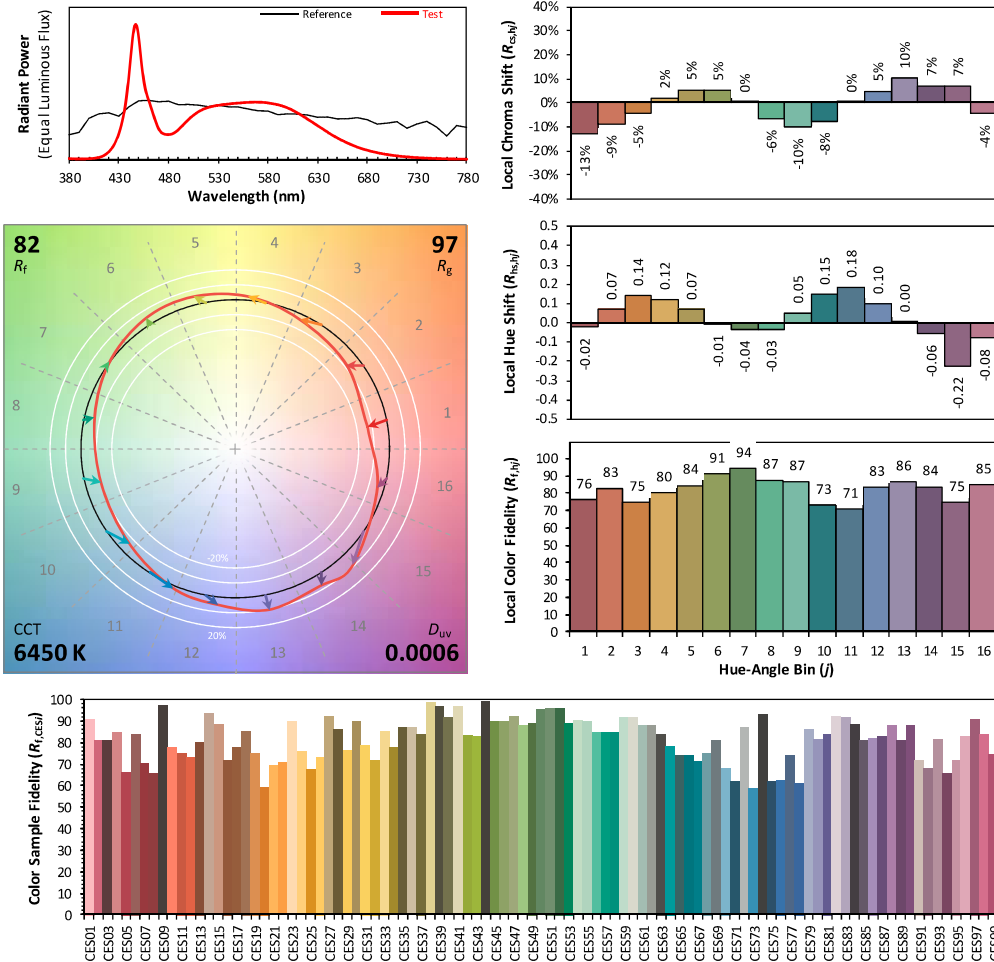
Ref. No.: LCZP23090162, V1.0

Source: SPD

Manufacturer: Huizhou Zenith Technology Co Ltd

Date: 2023/10/26

Model: ZS-BL2*2-S40-3065 (6500K)



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

x 0.3142
 y 0.3254
 u' 0.2002
 v' 0.4666

CIE 13.3-1995
(CRI)

R_a 82
 R_g 5

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	0.55 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

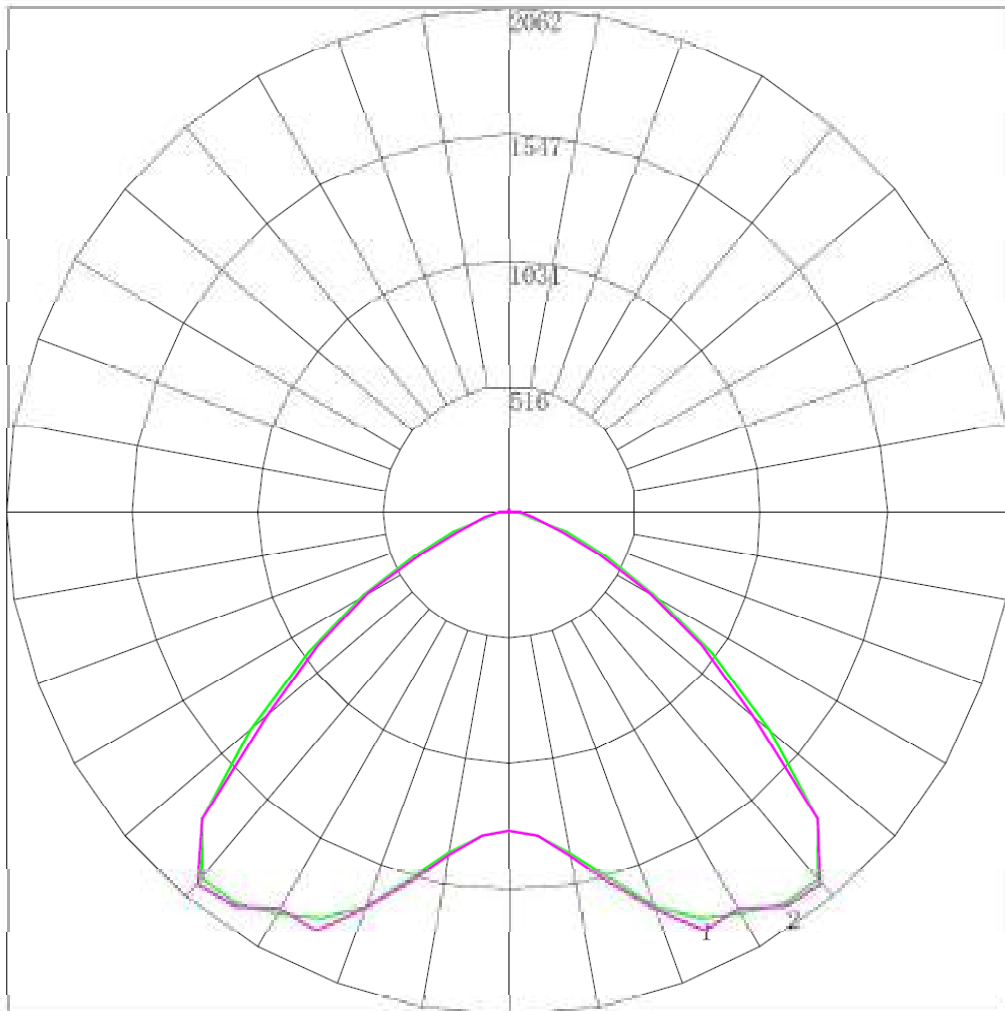
Zone	Lumens	%Lamp	%Fixt
0-20	579.98	10.60	10.60
0-30	1448.00	26.50	26.50
0-40	2688.34	49.20	49.20
0-60	4871.41	89.20	89.20
0-80	5424.89	99.30	99.30
0-90	5449.43	99.80	99.80
10-90	5318.85	97.40	97.40
20-40	2108.36	38.60	38.60
20-50	3417.84	62.60	62.60
40-70	2603.08	47.70	47.70
60-80	553.49	10.10	10.10
70-80	133.47	2.40	2.40
80-90	24.54	0.40	0.40
90-110	2.52	0.00	0.00
90-120	3.78	0.10	0.10
90-130	5.30	0.10	0.10
90-150	8.26	0.20	0.20
90-180	11.72	0.20	0.20
110-180	9.20	0.20	0.20
0-180	5461.15	100.00	100.00

Total Luminaire Efficiency = 100.00%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	130.58
10-20	449.39
20-30	868.03
30-40	1240.34
40-50	1309.47
50-60	873.59
60-70	420.01
70-80	133.47
80-90	24.54
90-100	1.42
100-110	1.10
110-120	1.26
120-130	1.52
130-140	1.48
140-150	1.48
150-160	1.52
160-170	1.36
170-180	0.58

4.5 Polar Curves of 3000K



Maximum Candela = 2062.38 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	17.7	19.2	18.0	19.5	19.8	17.3	18.9	17.7	19.2	19.5
	3H	18.3	19.7	18.7	20.0	20.4	18.0	19.4	18.4	19.7	20.1
	4H	18.4	19.7	18.8	20.0	20.4	18.1	19.4	18.5	19.7	20.1
	6H	18.4	19.6	18.8	20.0	20.4	18.1	19.3	18.5	19.6	20.0
	8H	18.4	19.5	18.8	19.9	20.3	18.1	19.2	18.5	19.6	20.0
	12H	18.4	19.5	18.8	19.8	20.3	18.0	19.1	18.5	19.5	20.0
4H	2H	17.8	19.1	18.2	19.5	19.9	17.5	18.8	17.9	19.2	19.6
	3H	18.6	19.7	19.0	20.1	20.5	18.3	19.4	18.7	19.8	20.2
	4H	18.7	19.7	19.2	20.1	20.6	18.5	19.4	18.9	19.8	20.3
	6H	18.8	19.6	19.2	20.1	20.5	18.5	19.3	19.0	19.8	20.2
	8H	18.8	19.5	19.2	20.0	20.5	18.5	19.3	19.0	19.7	20.2
	12H	18.8	19.4	19.2	19.9	20.4	18.5	19.2	19.0	19.7	20.1
8H	4H	18.8	19.5	19.2	20.0	20.4	18.5	19.3	19.0	19.7	20.2
	6H	18.8	19.4	19.3	19.9	20.4	18.5	19.2	19.0	19.7	20.1
	8H	18.8	19.4	19.3	19.9	20.4	18.5	19.1	19.1	19.6	20.1
	12H	18.8	19.3	19.3	19.8	20.4	18.5	19.1	19.1	19.5	20.1
12H	4H	18.7	19.4	19.2	19.9	20.4	18.5	19.2	18.9	19.6	20.1
	6H	18.8	19.4	19.3	19.8	20.4	18.5	19.1	19.0	19.6	20.1
	8H	18.8	19.3	19.3	19.8	20.3	18.5	19.0	19.0	19.5	20.1

Maximum UGR = 20.6

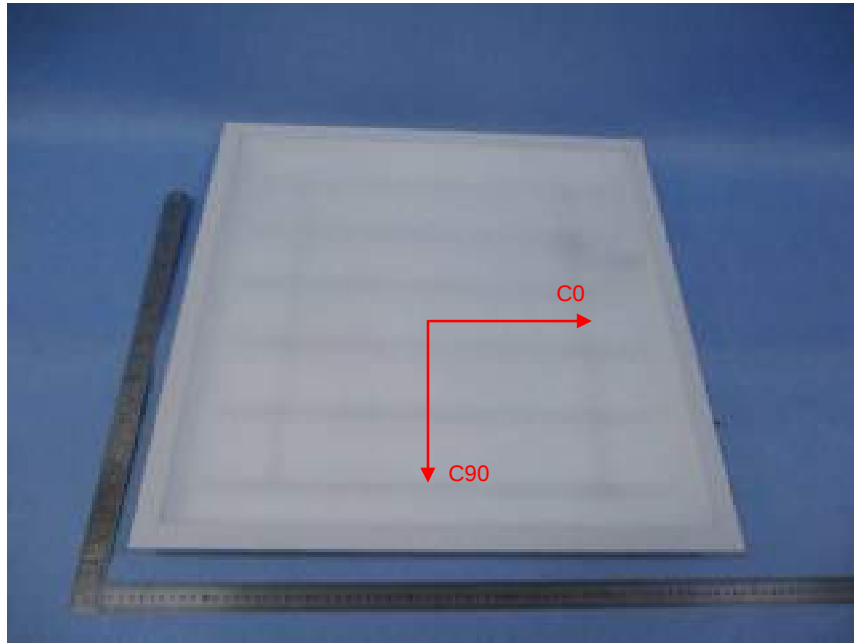
Note:

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	1308.042	1308.042	1308.042	1308.042	1308.042	1308.042	1308.042
5	1336.187	1336.659	1336.945	1339.679	1338.380	1338.916	1337.561
10	1420.173	1424.948	1430.377	1432.565	1428.326	1428.200	1429.591
15	1552.854	1562.861	1568.175	1567.859	1569.548	1565.520	1566.971
20	1719.039	1723.567	1733.307	1740.622	1736.866	1733.699	1732.497
25	1835.191	1848.070	1892.836	1923.934	1917.249	1894.727	1890.758
30	1901.754	1931.220	2002.847	2062.380	2004.861	1909.799	1881.702
35	1958.936	1977.041	2022.119	2045.878	1975.767	1966.152	1972.830
40	1964.744	1969.668	1968.824	1842.309	1947.670	1980.144	1988.336
45	1783.816	1809.414	1736.992	1619.260	1746.229	1784.957	1782.646
50	1387.562	1418.929	1320.878	1313.247	1347.778	1347.339	1300.204
55	1012.750	1016.364	930.984	969.533	899.273	949.397	956.812
60	687.526	687.348	632.307	617.952	622.797	668.237	664.828
65	430.653	420.468	407.577	388.391	406.240	404.433	401.334
70	250.172	243.646	231.014	234.037	231.695	235.822	227.251
75	111.684	112.431	116.290	119.592	114.055	108.223	102.555
80	40.653	42.245	46.828	49.583	47.237	43.511	42.632
85	20.550	21.458	21.509	21.539	21.145	21.192	20.877
90	2.680	2.682	2.689	2.467	2.248	2.253	1.814
95	0.893	1.117	0.896	0.897	0.899	0.902	0.903
100	0.893	0.894	0.896	0.897	0.899	0.902	0.903
105	1.340	1.341	0.896	1.123	1.123	1.126	0.903
110	1.340	0.894	1.344	0.897	0.899	0.902	0.903
115	1.340	1.341	1.344	1.346	1.349	1.353	1.358
120	1.787	1.341	1.344	1.346	1.349	1.353	1.358
125	1.787	1.788	1.792	1.795	1.799	1.804	1.814
130	2.234	1.788	1.792	1.795	1.799	1.804	1.814
135	2.234	1.788	1.792	1.795	1.799	1.804	1.814
140	2.234	2.235	2.241	2.244	2.249	2.028	1.814
145	2.680	2.235	2.241	2.244	2.249	2.255	2.269
150	2.680	2.906	2.689	2.692	2.700	2.704	2.269
155	3.127	3.129	3.137	3.141	3.149	3.156	3.176
160	4.467	4.470	4.481	4.487	4.499	3.607	3.627
165	4.467	5.365	4.930	4.487	4.499	4.962	4.538
170	5.808	5.812	5.825	5.385	5.398	5.411	5.896
175	6.254	6.259	6.274	6.282	6.297	6.313	6.348
180	6.290	6.290	6.290	6.290	6.290	6.290	6.290

Appendix A Product Photo



Picture 1



Picture 2

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