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NVLAP TESTING
NVLAP LAB CODE 500080-0

Ref. No.: LCZP21110164
Version: 1.0
Date of Issue: Dec. 28, 2021
Total pages: 15

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.:

ZS-TF2*4-Q01-S60-3050

Test Date: Dec. 1, 2021 to Dec. 11, 2021

Test Lab.:
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Template No.: LC-RT-PL-092 Rev.1.0

Test Note:

Complied by:		**Reviewed by:**	
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Dec. 28, 2021		**Dec. 28, 2021**	

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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	ZS-TF2*4-Q01-S60-3050
Rated Inputs	AC100-277V, 50/60Hz
Rated Power	40W,50W,60W
Rated Light output	5000lm,6250lm,7500lm
Declared CCT	3000K,4000K,5000K
Power Supply	CNT-TG-402
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.	211120108004
Date of Receipt Samples	Nov. 20, 2021
Note	This is a color tunable product, 3000K, 4000K and 5000K are selected for the test. Wattage can adjust 40W, 50W and 60W, 60W was 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*	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:

**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	2020-12-23	2021-12-22
AC Power supply	LC-I-989	APW-120N	2020-12-23	2021-12-22
Power analyzer	LC-I-928	WT210	2020-12-25	2021-12-24
Power analyzer	LC-I-954	WT210	2020-12-25	2021-12-24
Multimeter	LC-I-972	Fluke	2021-07-12	2022-07-11
Photometric colorimetric electric system** (2 meter sphere)	LC-I-956	HAAS-2000	Before use	Before use
Standard lamp***	LC-PL-I-011	D204C	2021-07-09	2022-07-08
Luminous Flux Standard Lamp****	LC-PL-I-003	24V/100W	2021-07-09	2022-07-08
Goniophotometer(with mirror)	LC-I-902	GMS2000	2021-04-22	2022-04-21
Wireless temperature transmitter	LC-I-PL-009	DWLR-DLR	2020-12-24	2021-12-23
Wireless temperature transmitter	LC-I-PL-008	DWLR-DLR	2020-12-24	2021-12-23

Note:

*** Bandwidth of spectroradiometer is 1 nm.*

**** halogen lamp, 100W, omni-directional type, and its traceability to NIM.*

***** halogen lamp, 100W, 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	4000K	5000K
Input Voltage & Frequency	119.98 V~60Hz	120.01 V ~60Hz	119.96 V~60Hz
Input Current(A)	0.485	0.475	0.482
Total Power(W)	57.54	56.29	57.20
Power Factor	0.989	0.989	0.989
I-THD	11.60%	11.68%	11.71%
Off-state Power(W)	-	-	-

3.2 Photometric data

Criteria Item	Result		
	3000K	4000K	5000K
Total Lumens(lm)	8442.21	8586.17	8777.68
Luminaire Efficacy(lm/W)	146.72	152.53	153.46
Correlated Color Temperature (CCT)(K)	3089	3989	4969
Color Rendering Index (CRI)	84	85	84
R9	9	16	10
R_f	85	85	84
R_g	97	95	95
$R_{cs,h1}$	-11%	-11%	-12%
Chromaticity Coordinate (x,y)	0.4294, 0.3989	0.3806, 0.3758	0.3466, 0.3585
Chromaticity Coordinate (u',v')	0.2479, 0.5182	0.2256, 0.5012	0.2098, 0.4882
Duv	-0.0010	-0.0005	0.0029
Zone Lumens between 0-60º	77.50%	-	-
Maximum UGR*	21.8	-	-

3.3 Color Rendering Details of 3000K

R1	R2	R3	R4	R5	R6	R7	R8
82	92	96	82	83	90	83	60
R9	R10	R11	R12	R13	R14	R15	-
9	81	82	73	85	99	75	-

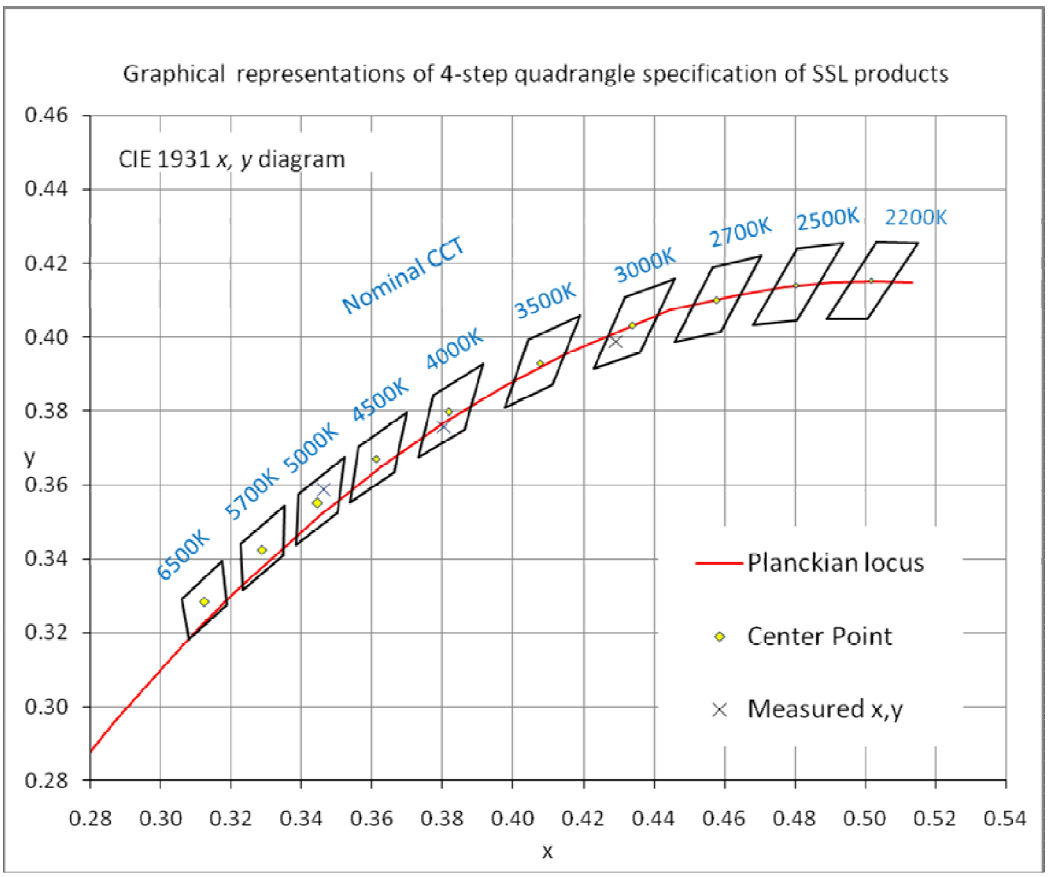
3.4 Electrical data on 277V of 3000K

Criteria Item	Result
Input Voltage & Frequency	277.02 V~60Hz
Power Factor	0.921
I-THD	16.88 %

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

4. Test Data

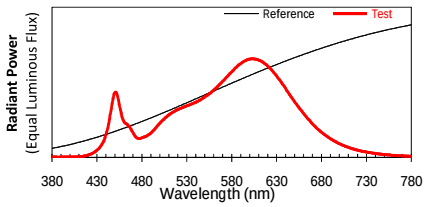
4.1 ANSI Chromaticity Quadrangles Diagram

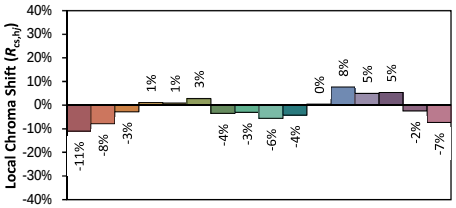


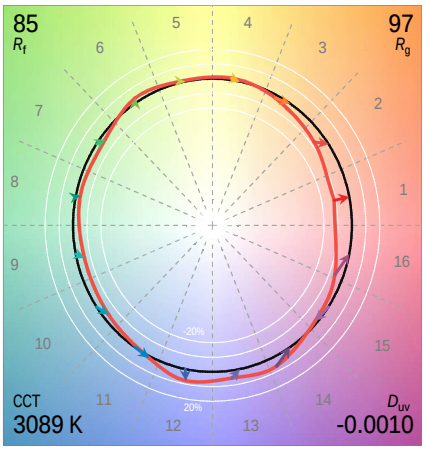
4.2 ANSI/IES TM-30-18 Color Rendition

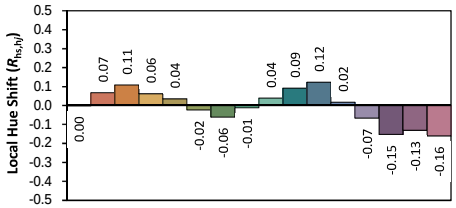
ANSI/IES TM-30-18 Color Rendition Report

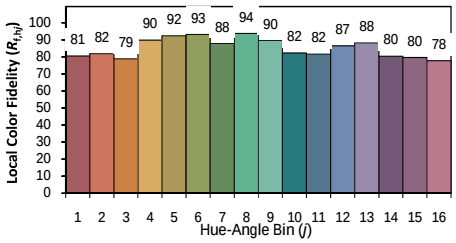
Source:	User SPD	**Manufacturer:**	Beyond LED Technology
Date:	2021/12/1	**Model:**	ZS-TF2*4-Q01-S60-3050

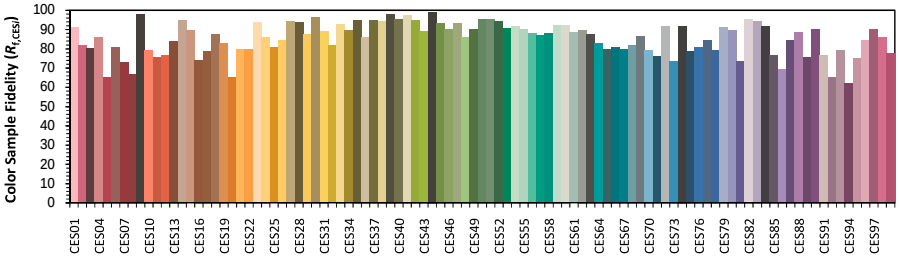












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information, Created with the IES TM-30-18 Calculator Version 2.00.

x	0.4294
y	0.3989
u'	0.2479
v'	0.5182

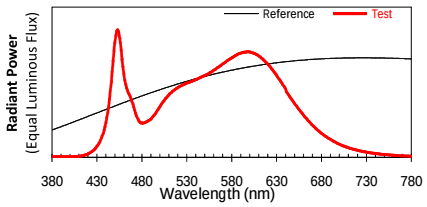
CIE 13.3-1995 (CRI)

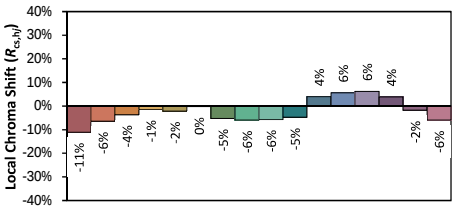
R_a	84
R_9	9

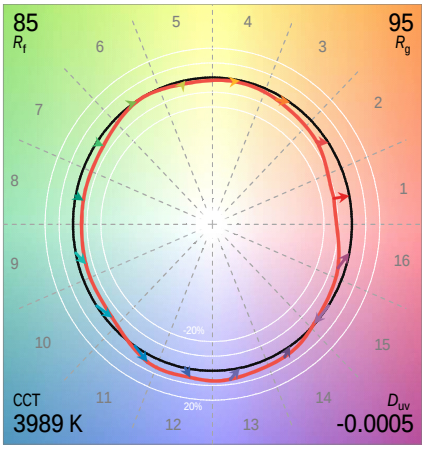
Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

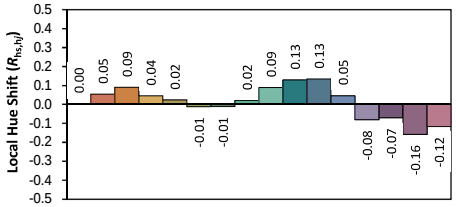
ANSI/IES TM-30-18 Color Rendition Report

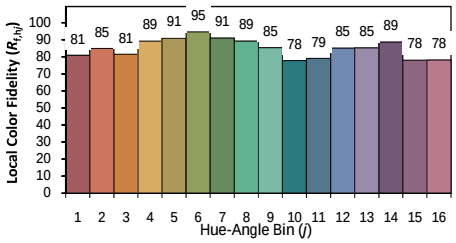
Source:	User SPD	**Manufacturer:**	Beyond LED Technology
Date:	2021/12/1	**Model:**	ZS-TF2*4-Q01-S60-3050

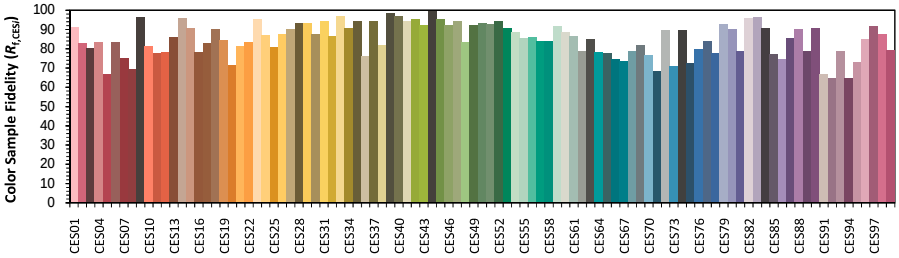












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information, Created with the IES TM-30-18 Calculator Version 2.00.

x	0.3806
y	0.3758
u'	0.2256
v'	0.5012

CIE 13.3-1995 (CRI)

R_a	85
R_9	16

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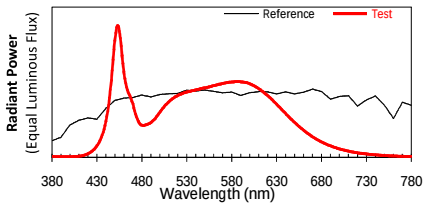
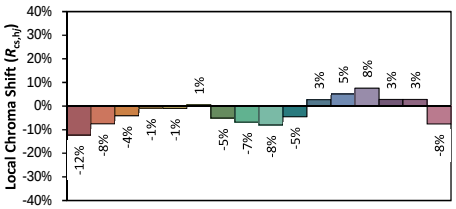
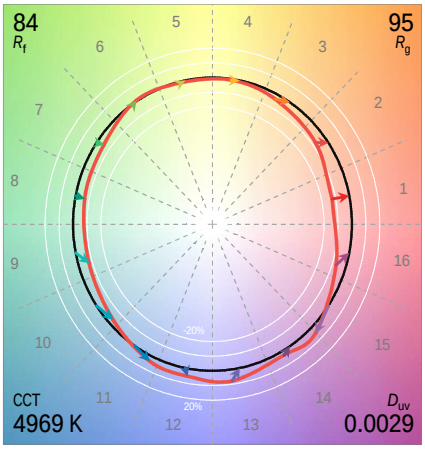
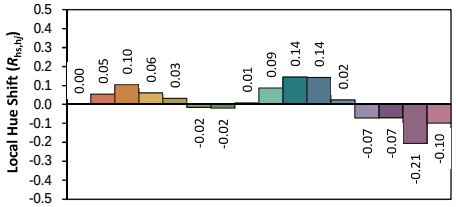
ANSI/IES TM-30-18 Color Rendition Report

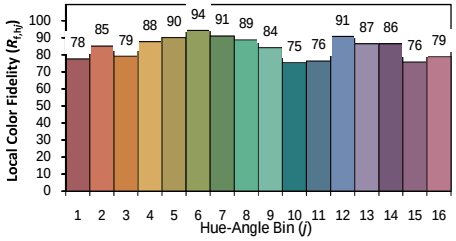
Source:	User SPD	**Manufacturer:**	Beyond LED Technology
Date:	2021/12/1	**Model:**	ZS-TF2*4-Q01-S60-3050

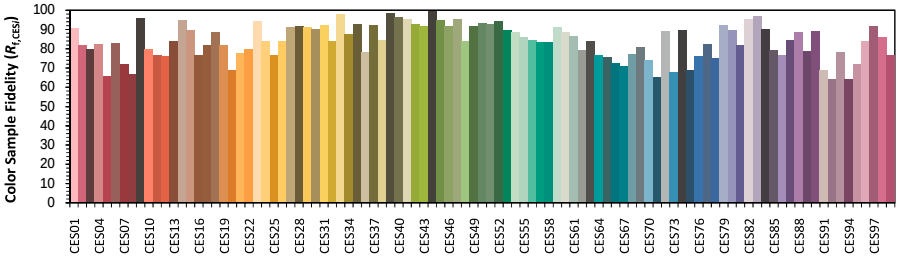












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information, Created with the IES TM-30-18 Calculator Version 2.00.

x	0.3466
y	0.3585
u'	0.2098
v'	0.4882

CIE 13.3-1995 (CRI)

R_a	84
R_9	10

Colors are for visual orientation purposes only. Created with the ANSI/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)	1.26	Luminous Length	1.18 m
Spacing Criteria (90-270)	1.28	Luminous Width	0.56 m
Spacing Criteria (Diagonal)	1.40	Luminous Height	0.00 m
Test Distance	30.10 m		

4.4 Zonal Lumen Summary of 3000K

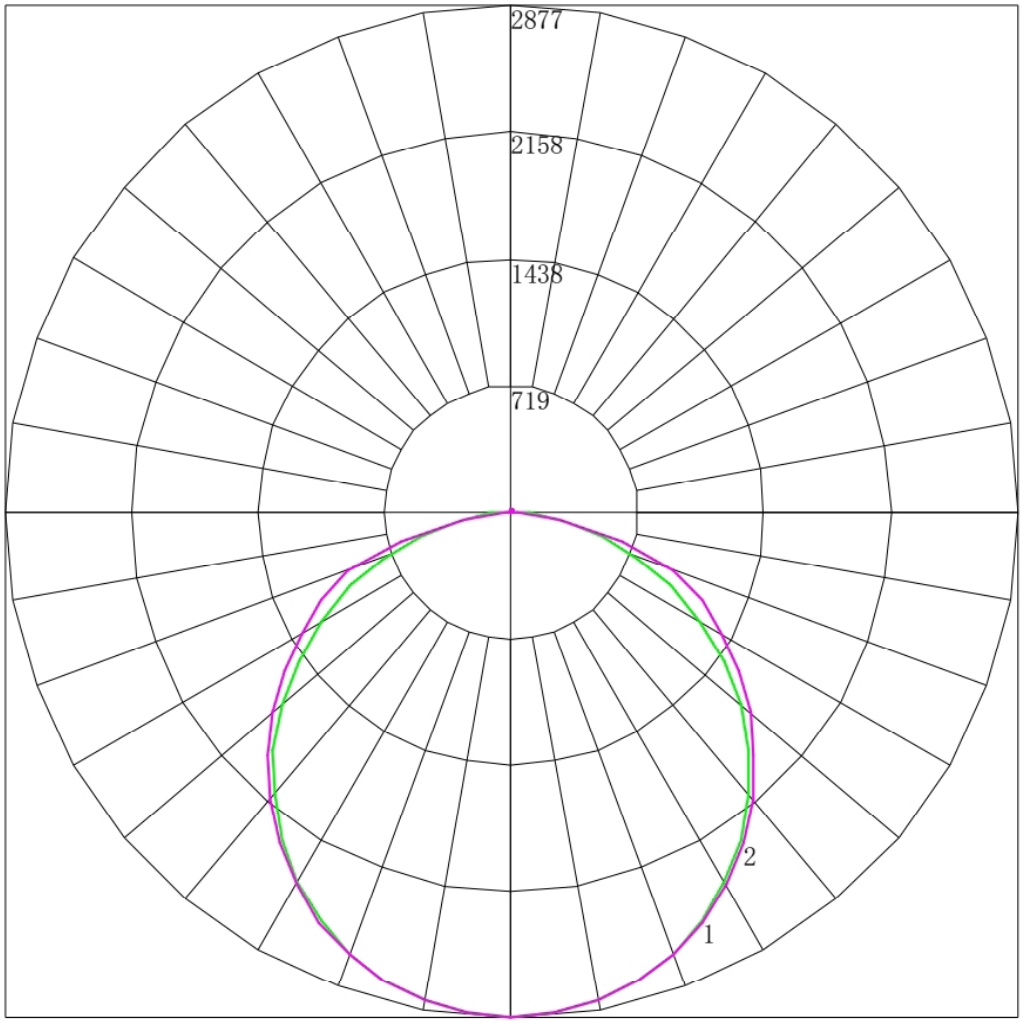
Zone	Lumens	%Lamp	%Fixt
0-20	1053.71	12.50	12.50
0-30	2241.41	26.60	26.60
0-40	3676.88	43.60	43.60
0-60	6542.42	77.50	77.50
0-80	8279.69	98.10	98.10
0-90	8410.76	99.60	99.60
10-90	8138.43	96.40	96.40
20-40	2623.17	31.10	31.10
20-50	4118.75	48.80	48.80
40-70	3951.73	46.80	46.80
60-80	1737.27	20.60	20.60
70-80	651.08	7.70	7.70
80-90	131.07	1.60	1.60
90-110	11.81	0.10	0.10
90-120	15.27	0.20	0.20
90-130	18.74	0.20	0.20
90-150	24.91	0.30	0.30
90-180	31.45	0.40	0.40
110-180	19.64	0.20	0.20
0-180	8442.21	100.00	100.00

Total Luminaire Efficiency = 100.00%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	272.33
10-20	781.38
20-30	1187.7
30-40	1435.47
40-50	1495.58
50-60	1369.97
60-70	1086.19
70-80	651.08
80-90	131.07
90-100	7.41
100-110	4.41
110-120	3.45
120-130	3.47
130-140	2.98
140-150	3.20
150-160	3.22
160-170	2.44
170-180	0.87

4.5 Polar Curves of 3000K



Maximum Candela = 2876.733 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	16.8	18.4	17.2	18.8	19.1	17.3	18.9	17.7	19.3	19.6
	3H	18.6	20.1	18.9	20.4	20.8	19.5	21.0	19.9	21.3	21.7
	4H	19.2	20.7	19.6	21.0	21.4	20.3	21.7	20.7	22.1	22.4
	6H	19.8	21.1	20.2	21.4	21.8	20.7	22.0	21.1	22.3	22.7
	8H	19.9	21.2	20.3	21.5	21.9	20.7	21.9	21.1	22.3	22.7
	12H	20.0	21.2	20.4	21.6	22.0	20.7	21.9	21.1	22.3	22.7
4H	2H	17.5	18.9	17.9	19.3	19.7	17.9	19.3	18.3	19.7	20.0
	3H	19.5	20.7	20.0	21.1	21.5	20.4	21.6	20.8	22.0	22.4
	4H	20.4	21.5	20.8	21.9	22.3	21.3	22.4	21.7	22.8	23.2
	6H	21.0	22.0	21.5	22.4	22.8	21.7	22.7	22.2	23.1	23.6
	8H	21.2	22.1	21.7	22.5	23.0	21.8	22.7	22.2	23.1	23.6
	12H	21.3	22.1	21.8	22.6	23.1	21.8	22.6	22.3	23.1	23.5
8H	4H	20.8	21.7	21.3	22.1	22.6	21.6	22.5	22.1	22.9	23.4
	6H	21.6	22.3	22.1	22.8	23.3	22.1	22.8	22.6	23.3	23.8
	8H	21.8	22.5	22.4	23.0	23.5	22.2	22.9	22.7	23.4	23.8
	12H	22.0	22.6	22.5	23.1	23.7	22.2	22.8	22.7	23.3	23.9
12H	4H	20.9	21.6	21.3	22.1	22.6	21.7	22.4	22.1	22.9	23.4
	6H	21.7	22.3	22.2	22.8	23.3	22.2	22.8	22.7	23.3	23.8
	8H	22.0	22.5	22.5	23.0	23.6	22.3	22.9	22.8	23.4	23.9

Maximum UGR = 23.9

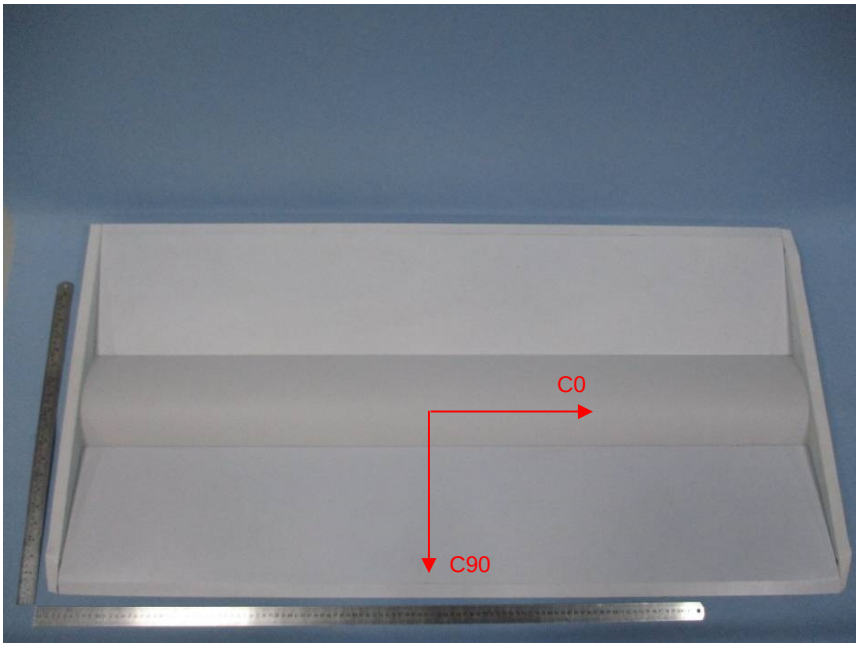
Note:

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

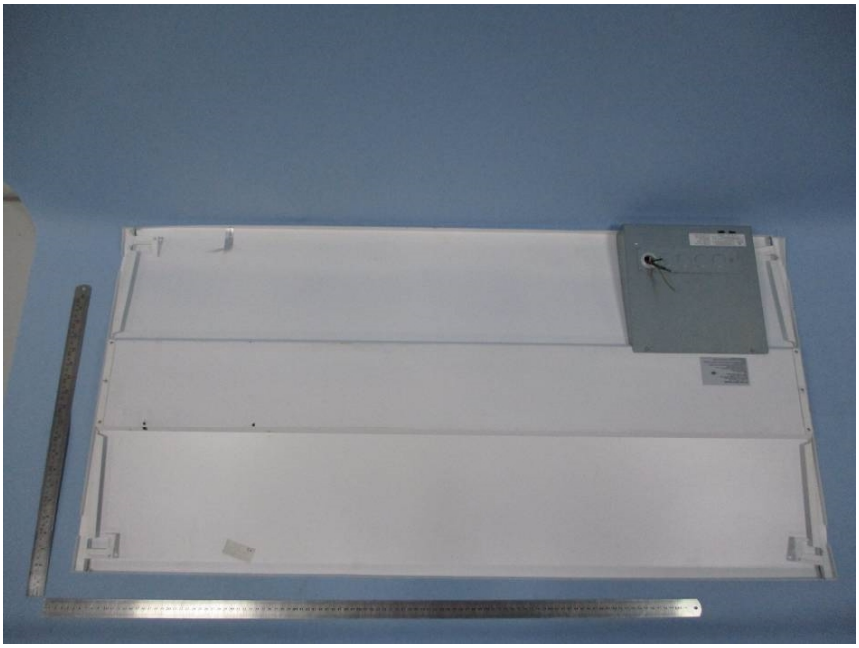
4.7 Candela Tabulation of 3000K

	0	15	30	45	60	75	90
0	2876.733	2876.733	2876.733	2876.733	2876.733	2876.733	2876.733
5	2863.968	2865.343	2865.422	2865.851	2865.197	2864.989	2865.054
10	2825.672	2827.983	2828.531	2830.717	2829.248	2827.951	2829.566
15	2766.405	2766.706	2766.297	2768.616	2769.101	2769.462	2768.474
20	2680.696	2682.190	2683.460	2686.798	2686.344	2687.028	2686.268
25	2567.632	2569.881	2571.882	2582.313	2579.841	2581.564	2580.705
30	2429.950	2434.795	2437.909	2450.172	2468.882	2454.865	2452.680
35	2273.576	2277.152	2283.322	2300.128	2307.590	2308.296	2304.890
40	2098.055	2101.744	2109.062	2128.096	2138.671	2146.366	2140.480
45	1912.047	1911.070	1909.139	1963.211	1952.601	1963.010	1951.812
50	1697.774	1706.729	1712.069	1743.920	1762.184	1782.088	1774.375
55	1479.397	1483.478	1498.399	1531.763	1561.837	1583.589	1581.664
60	1245.976	1252.482	1294.633	1314.404	1350.878	1378.299	1379.520
65	1003.437	1017.388	1042.784	1090.691	1141.250	1180.000	1191.751
70	764.089	779.333	816.229	875.826	939.797	987.620	984.666
75	533.860	575.960	594.839	664.182	688.020	686.868	650.005
80	315.939	344.196	384.022	365.035	292.782	249.910	277.611
85	109.872	124.156	110.997	63.315	43.556	31.818	33.241
90	11.853	11.389	11.309	10.641	10.389	10.378	13.476
95	5.471	5.467	5.432	5.665	5.652	5.645	5.840
100	4.559	4.556	4.752	4.987	4.975	4.969	4.941
105	4.103	4.328	4.074	4.080	4.070	4.290	4.492
110	3.647	3.417	3.394	3.399	3.391	3.387	3.594
115	3.191	3.189	3.394	3.399	3.391	3.387	3.594
120	3.647	3.645	3.622	3.852	3.843	3.839	4.043
125	3.647	3.645	3.846	4.080	4.070	4.290	4.492
130	3.647	3.645	3.622	3.627	3.618	3.839	4.043
135	3.647	3.645	3.622	3.627	3.618	3.839	4.043
140	4.559	4.329	4.302	4.308	4.298	4.292	4.043
145	5.015	5.012	4.980	4.987	4.975	5.195	4.941
150	5.927	6.151	6.113	6.121	6.107	6.098	6.289
155	6.839	6.834	7.015	6.800	7.011	7.454	7.187
160	7.750	7.745	7.696	7.932	7.916	7.905	8.086
165	8.662	8.657	8.601	8.839	8.818	8.582	8.535
170	9.118	9.568	9.507	9.520	9.497	9.485	9.433
175	10.030	10.024	9.959	9.973	9.950	9.937	9.883
180	5.015	5.015	5.015	5.015	5.015	5.015	5.015

Appendix A Product Photo



Picture 1



Picture 2

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