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NVLAP TESTING
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LCTECH GUANGDONG TESTING SERVICES CO.,LTD. LABORATORY

Test report of

IES LM-79-08

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

Rendered to:

ETI Solid State Lighting (Zhuhai) Ltd
No.1, Zhongzhu Road South,Science & Technology Innovation Coast, High Tech District, Zhuhai City, Guangdong Prov., China

For products:

Direct Linear Ambient Luminaires

Models No.:

556091###(##=11-30,#=0-9)

(The product is a color tunable luminaire, 11-30 represents this product can tunable to 3000K, 4000K, 5000K, the 0-9 denotes different manufacture factory .)

Test Date:	May. 31, 2021 to Jun. 1, 2021
Test Lab.:	**LCTECH Guangdong Testing Services Co., Ltd.** 2/F., Technology and Enterprise Development Center, Guangyuan Road, Xiaolan, Zhongshan, Guangdong, China Tel:+86-760-22833366 Fax:+86-760-22833399 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-046 Rev.1.3
Test Note:	

Complied by:		**Reviewed by:**	
Fish Tan	Fish Tan	**Lin Qiu**	Lin
Jun. 4, 2021		**Jun. 4, 2021**	

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1. General

1.1 Product Information

Brand Name	ETI
Factory 1	Name: ETI Solid State Lighting (Zhuhai) Ltd Address: No.1, Zhongzhu Road South, Science & Technology Innovation Coast, High Tech District, Zhuhai City, Guangdong Prov., China
Factory 2	Name: NVC VIETNAM TECHNOLOGY AND LIGHTING COMPANY LIMITED Address: Lot CN23-1, Yen Phong Industrial park, Dong Phong commune, Yen Phong district, Bac Ninh province VIETNAM
Category	Indoor
General Application	Linear Ambient
Primary Use	Direct Linear Ambient Luminaires
Model Number	556091###(##=11-30,#=0-9)
Rated Inputs	AC120V, 60Hz
Rated Power	17W
Rated Light output	2000lm
Declared CCT	3000K, 4000K, 5000K
Power Supply	ETI-AD01700270054SDA
LED Package, Array or Module	SPMWH22286D5WAT0S3, Samsung Electronics Co., LTD.
Dimming	Continuous Dimming
Integral Controls	No
Controls Controllability	No
Receipt Samples	1 unit
Sample Code of lab.	210521102006
Date of Receipt Samples	May. 21, 2021
Note	This product is colortunable, all the CCT settings was tested.

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	2020-07-20	2021-07-19
Photometric colorimetric electric system** (2 meter sphere)	LC-I-956	HAAS-2000	Before use	Before use
Standard lamp***	LC-PL-I-011	D204C	2020-07-14	2021-07-13
Luminous Flux Standard Lamp****	LC-PL-I-003	24V/100W	2020-07-14	2021-07-13
Goniophotometer(with mirror)	LC-I-902	GMS-2000	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 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.

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	120.06 V~60Hz	120.08 V~60Hz	120.07 V~60Hz
Input Current(A)	0.151	0.143	0.148
Total Power(W)	17.24	16.32	16.88
Power Factor	0.954	0.948	0.952
I-THD	22.3%	23.0%	22.6%
Off-state Power(W)	-	-	-

3.2 Photometric data

Criteria Item	Result		
	3000K	4000K	5000K
Total Lumens(lm)	2027.66	2101.23	1983.56
Luminaire Length(ft)	4	4	4
Lumens per Foot(lm/ft)	506.92	525.31	495.89
Luminaire Efficacy(lm/W)	117.61	128.75	117.51
Correlated Color Temperature (CCT)(K)	3118	4118	5189
Color Rendering Index (CRI)	84.1	86.3	85.4
R9	13	22	15
R_f	85	85	84
R_g	99	95	94
$R_{cs,h1}$	-10%	-11%	-12%
Chromaticity Coordinate (x,y)	x = 0.4296 y = 0.4028	x = 0.3737 y = 0.3670	x = 0.3399 y = 0.3455
Chromaticity Coordinate (u',v')	u' = 0.2464 v' = 0.5198	u' = 0.2246 v' = 0.4962	u' = 0.2102 v' = 0.4809
Duv	0.0006	-0.0026	-0.0009
Zone Lumens between 0-60 º	58.64%	-	-

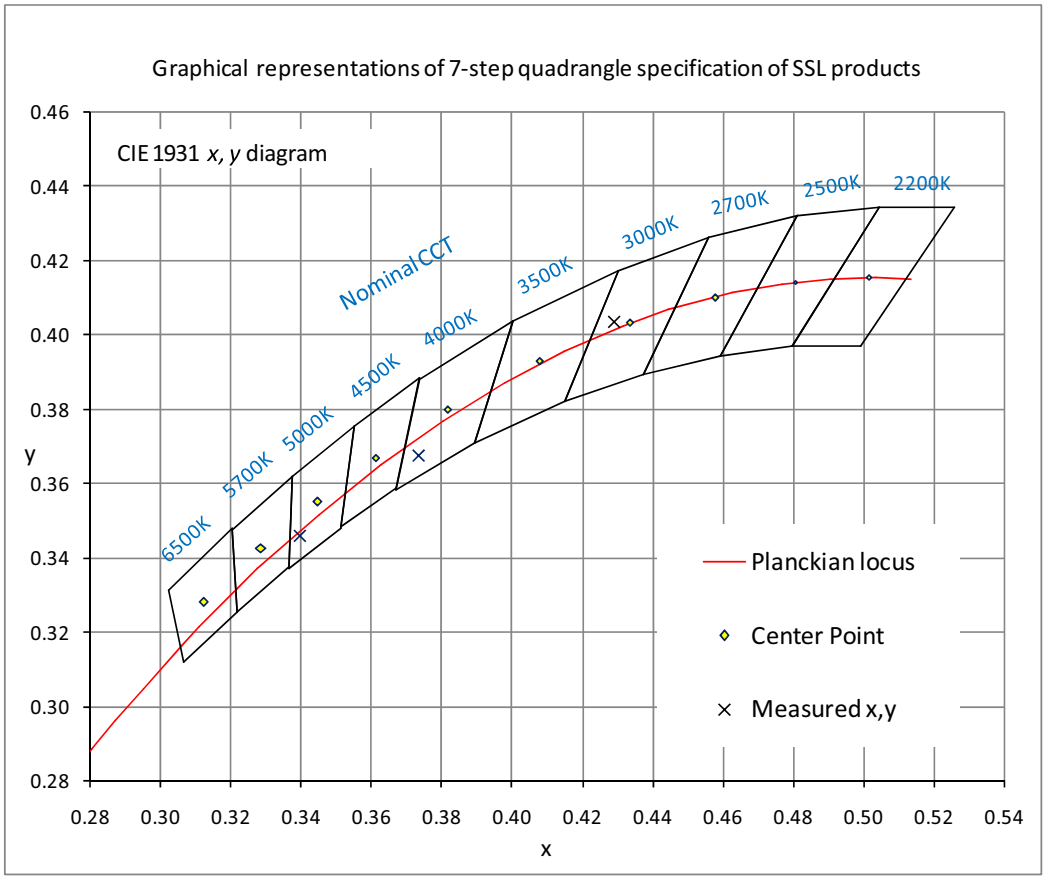
3.3 Color Rendering Details

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
3000K	83	90	97	84	83	88	85	63	13	77	85	75	84	98	75
4000K	86	94	96	84	86	90	86	68	22	85	84	67	89	99	81
5000K	85	93	95	83	85	88	85	68	15	83	83	65	88	98	80

Note: N/A

4. Test Data

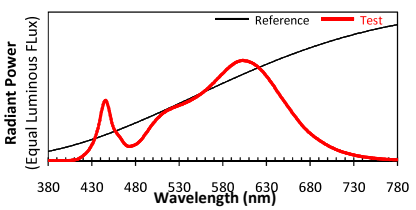
4.1 ANSI Chromaticity Quadrangles Diagram

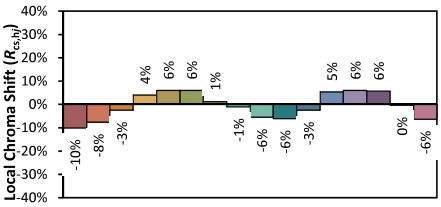


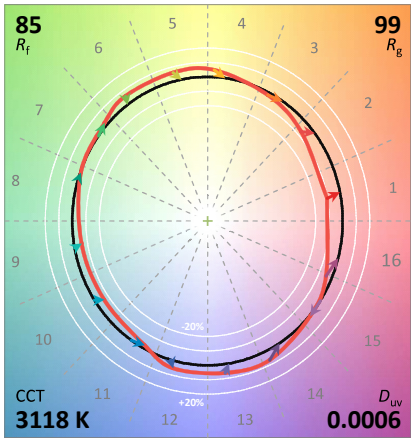
4.2 ANSI/IES TM-30-18 Color Rendition

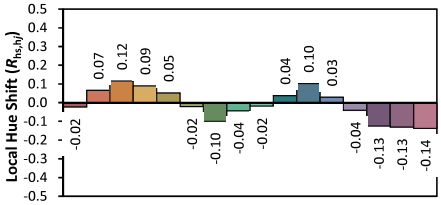
ANSI/IES TM-30-18 Color Rendition Report

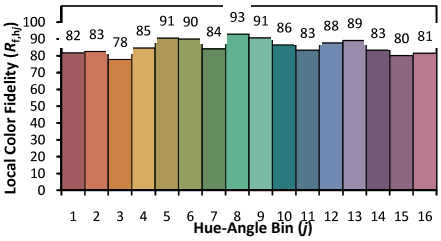
Source: User SPD
Manufacturer: ETI Solid State Lighting
Date: 20120/06/04
Model: 556091###(##=11-30, #=0-9)

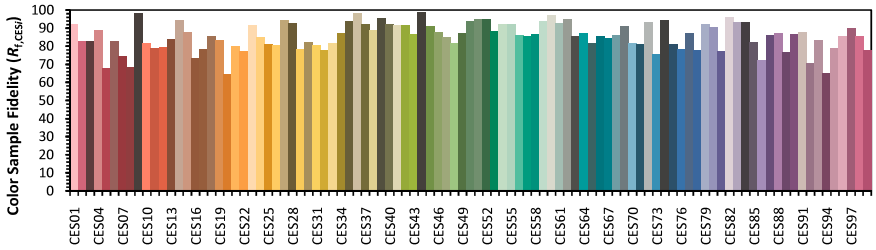












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

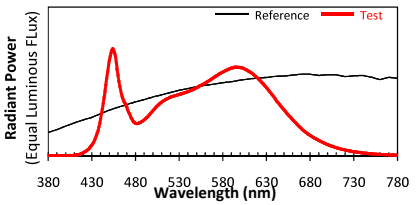
x	0.4296
y	0.4028
u'	0.2464
v'	0.5198

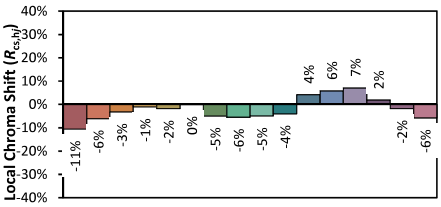
Colors are for visual orientation purposes only. Created with the IES TM-30-18 Calculator Version 2.00.

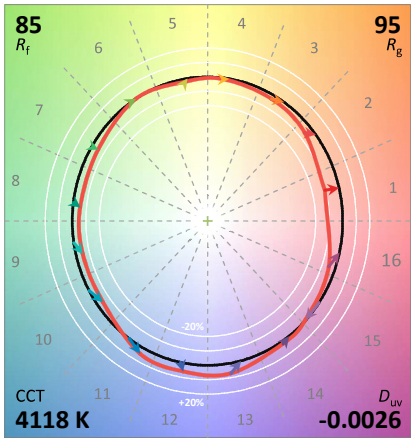
4.2 ANSI/IES TM-30-18 Color Rendition – Cont.

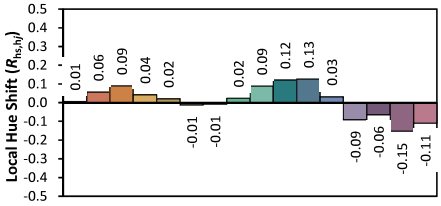
ANSI/IES TM-30-18 Color Rendition Report

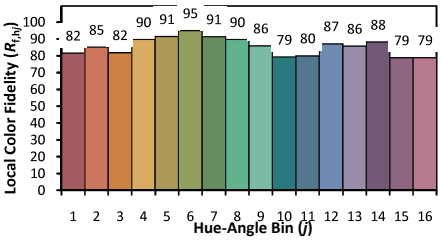
Source: User SPD
Manufacturer: ETI Solid State Lighting
Date: 20120/06/04
Model: 556091###(##=11-30, #=0-9)

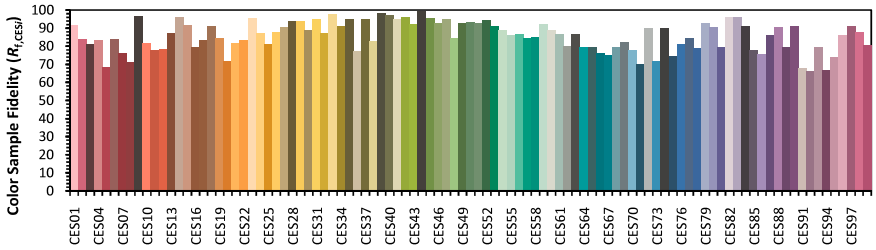












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

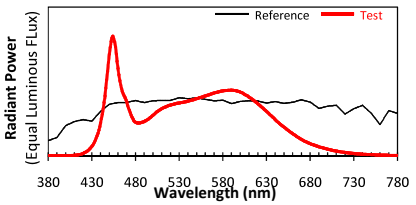
x	0.3737
y	0.3670
u'	0.2246
v'	0.4962

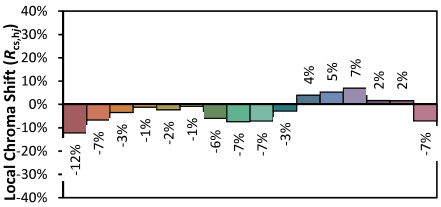
Colors are for visual orientation purposes only. Created with the IES TM-30-18 Calculator Version 2.00.

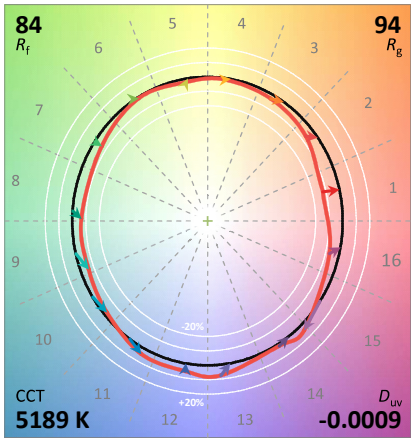
4.2 ANSI/IES TM-30-18 Color Rendition – Cont.

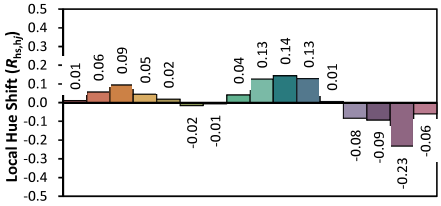
ANSI/IES TM-30-18 Color Rendition Report

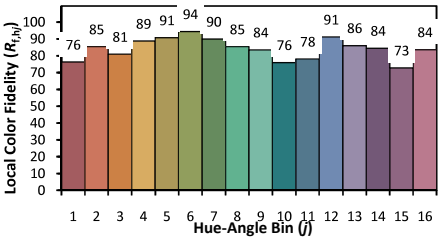
Source: User SPD
Manufacturer: ETI Solid State Lighting
Date: 20120/06/04
Model: 556091###(##=11-30, #=0-9)

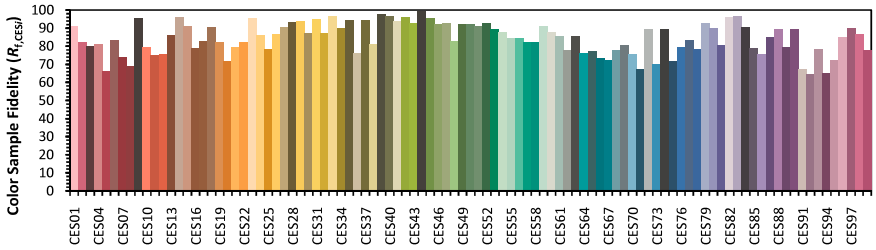












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3399
y	0.3455
u'	0.2102
v'	0.4809

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	Semi-Direct	Basic Luminous Shape	Rectangular w/Sides
Spacing Criteria (0-180)	1.26	Luminous Length	1.20 m
Spacing Criteria (90-270)	1.36	Luminous Width	0.04 m
Spacing Criteria (Diagonal)	1.44	Luminous Height	0.02 m
Test Distance	29.83 m		

4.4 Zonal Lumen Summary of 3000K

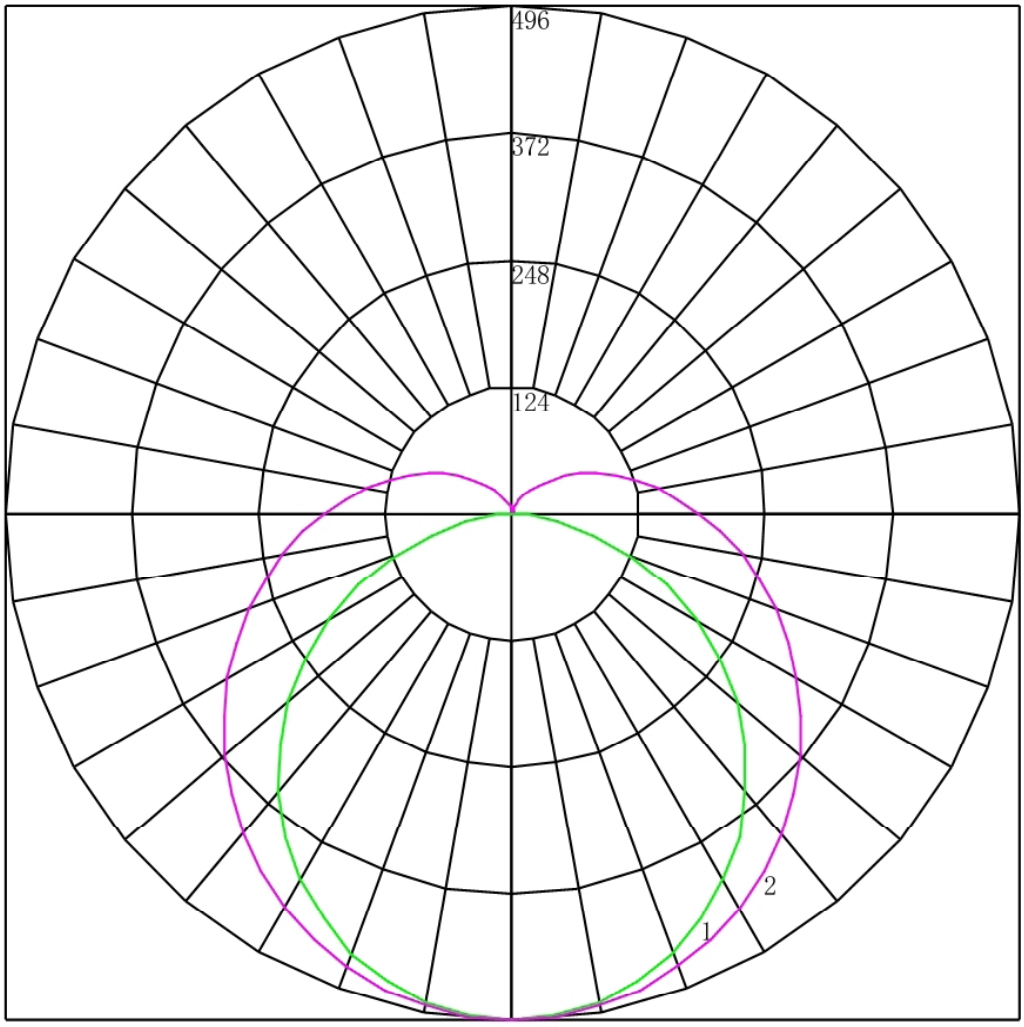
Zone	Lumens	%Lamp	%Fixt
0-20	182.04	9.00	9.00
0-30	389.27	19.20	19.20
0-40	644.71	31.80	31.80
0-60	1189.02	58.60	58.60
0-80	1617.11	79.80	79.80
0-90	1757.85	86.70	86.70
10-90	1710.91	84.40	84.40
20-40	462.67	22.80	22.80
20-50	738.62	36.40	36.40
40-70	781.22	38.50	38.50
60-80	428.09	21.10	21.10
70-80	191.18	9.40	9.40
80-90	140.74	6.90	6.90
90-110	171.30	8.40	8.40
90-120	217.61	10.70	10.70
90-130	245.48	12.10	12.10
90-150	266.36	13.10	13.10
90-180	269.82	13.30	13.30
110-180	98.52	4.90	4.90
0-180	2027.66	100.00	100.00

Total Luminaire Efficiency = 100.00%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	46.93
10-20	135.10
20-30	207.24
30-40	255.44
40-50	275.95
50-60	268.36
60-70	236.91
70-80	191.18
80-90	140.74
90-100	100.81
100-110	70.49
110-120	46.31
120-130	27.88
130-140	14.44
140-150	6.44
150-160	2.39
160-170	0.82
170-180	0.25

4.5 Polar Curves of 3000K

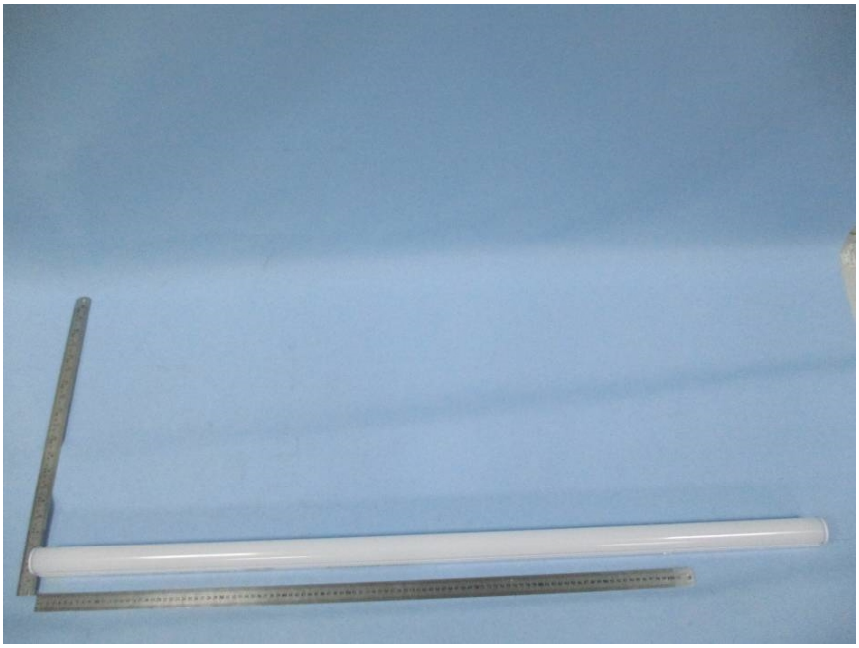


Maximum Candela = 495.635 Located At Horizontal Angle = 0, Vertical Angle = 0
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)

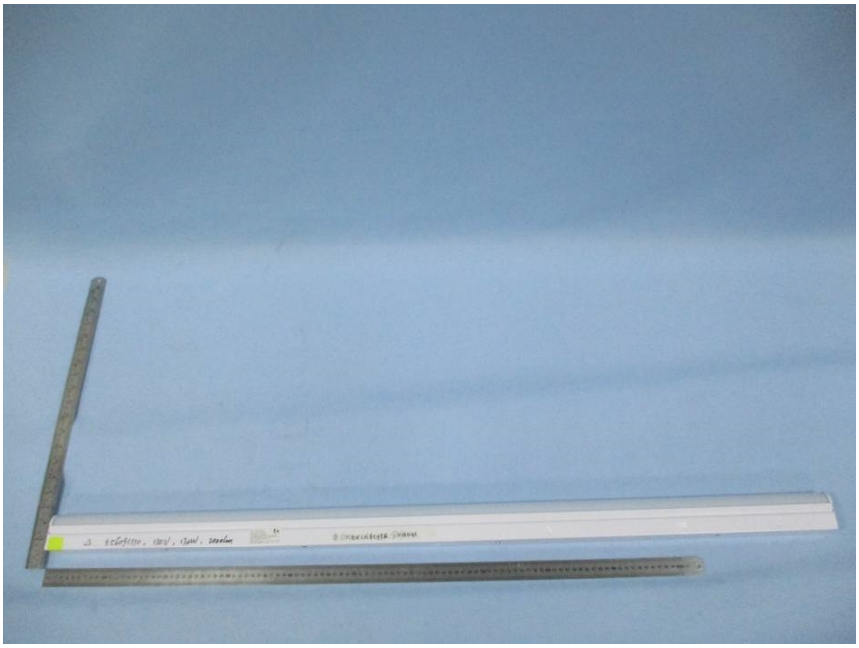
4.6 Candela Tabulation

	0	15	30	45	60	75	90
0	495.635	495.635	495.635	495.635	495.635	495.635	495.635
5	493.263	493.352	493.280	493.786	493.768	494.102	494.139
10	485.924	486.302	486.595	487.906	488.657	489.128	489.608
15	474.155	474.799	475.631	478.641	480.722	482.021	482.569
20	458.180	459.312	460.867	466.190	469.717	472.049	472.450
25	437.775	439.259	442.172	450.243	455.535	459.191	460.000
30	413.790	415.916	419.771	431.221	440.654	444.334	444.954
35	386.493	389.575	394.618	409.728	419.143	426.567	428.324
40	355.840	360.077	366.773	385.782	397.936	407.447	409.935
45	322.279	327.940	336.820	363.102	374.975	386.527	389.697
50	286.480	294.145	305.179	332.569	350.786	364.586	367.393
55	248.757	258.091	272.715	304.168	326.067	341.690	345.000
60	208.215	219.955	238.339	275.681	300.039	317.551	321.595
65	166.644	181.886	203.867	247.150	274.608	293.210	298.278
70	124.625	144.421	171.042	219.331	249.446	269.070	274.302
75	82.964	112.914	143.915	192.849	224.947	245.353	250.765
80	46.136	76.295	111.274	167.657	200.828	221.568	227.932
85	15.707	50.199	86.783	143.868	177.753	199.071	205.363
90	3.267	31.288	66.451	122.086	155.636	177.063	183.190
95	1.521	20.299	51.634	103.755	136.343	156.677	162.777
100	1.387	14.055	40.195	87.316	117.690	137.534	143.596
105	1.253	10.250	31.570	72.483	100.727	119.324	124.767
110	1.163	6.983	24.789	60.098	85.277	102.068	107.521
115	1.119	5.080	19.118	49.117	71.339	86.389	91.243
120	1.074	3.760	15.126	39.962	59.045	72.710	76.989
125	1.074	2.730	11.009	30.673	48.041	59.629	63.791
130	1.029	1.925	8.239	23.278	37.149	47.770	51.121
135	1.074	1.343	6.113	18.284	27.856	35.977	38.759
140	1.163	1.231	4.497	12.986	20.941	26.538	28.860
145	1.387	1.388	3.259	9.355	14.960	19.432	21.161
150	1.656	1.656	2.396	6.304	10.934	13.502	14.694
155	1.969	1.947	1.998	3.898	6.758	8.883	9.679
160	2.282	2.260	2.220	2.584	3.934	5.130	5.631
165	2.551	2.551	2.509	2.495	2.646	3.175	3.036
170	2.774	2.775	2.731	2.695	2.712	2.687	2.640
175	2.909	2.932	2.909	2.874	2.868	2.909	2.860
180	1.493	1.493	1.493	1.493	1.493	1.493	1.493

Appendix A Product Photo



Picture 1



Picture 2

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