

LM-79-08 Test Report

for

Philips Lighting (China) Investment Co., Ltd

Building 9, Lane 888, Tianlin Road, Minhang District, Shanghai China

TYPEB LED TUBE

Model: 9290019344

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18060001g

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Review by:



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Jun. 06, 2018

Approved by:



Manager: Jim Zhang

Jun. 06, 2018

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Test Summary

Sample Tested: **9290019344**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
132.1	1481.0	11.21	0.9892
CCT (K)	CRI	Stabilization Time (Light & Power)	
4030	83.8	60	

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

Test specifications:

Date of Receipt	: Jun. 01, 2018
Date of Test	: Jun. 04, 2018
Test item	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
Reference Standard	: IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

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Sample Photo

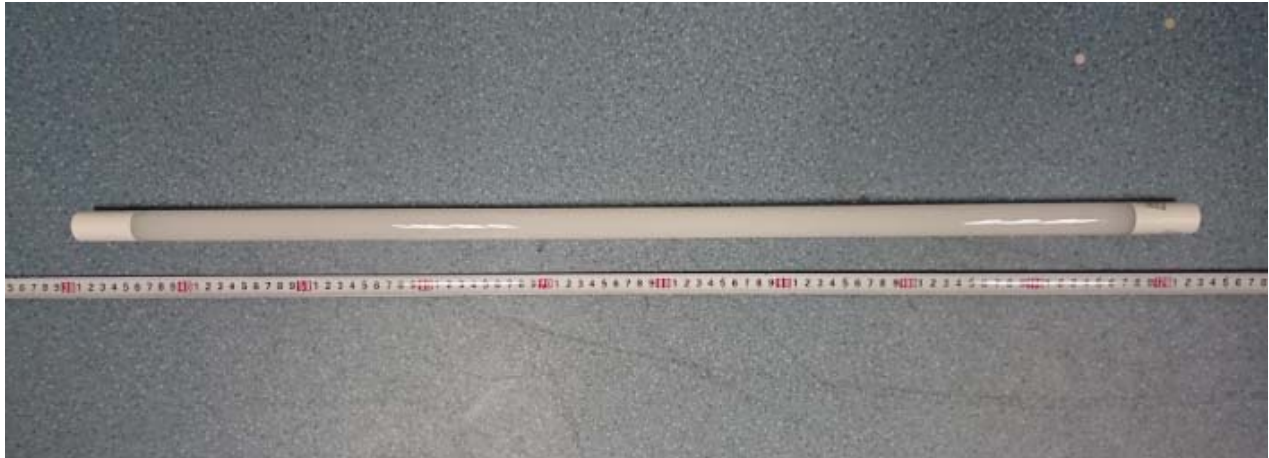


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: TYPEB LED TUBE
Model	: 9290019344
Electrical Ratings	: 120-277V, 50/60Hz, 11.5W
Product Description	: 11.5T8PRO/36-840/BB14/G FB
Manufacturer	: Philips Lighting (China) Investment Co., Ltd
Address	: Building 9, Lane 888, Tianlin Road, Minhang District, Shanghai China

TEST RESULTS

Test ambient temperature was 24.9°C.

Base orientation was horizontal. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 65 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.095	0.044
Power Factor	0.9892	0.9256
Test Power (W)	11.21	11.24
THD A%	13.48	20.31
Luminous Efficacy (lm/W)	132.1	130.4
Total Luminous Flux (lm)	1481.0	1466.0
Color Rendering Index (CRI)	83.8	
R9	8.8	
Correlated Color Temperature (CCT) (K)	4030	
Chromaticity Chroma x	0.3797	
Chromaticity Chroma y	0.3785	
Chromaticity Chroma u	0.2239	
Chromaticity Chroma v	0.3348	
Duv	0.0004	
Chromaticity Chroma u'	0.2239	
Chromaticity Chroma v'	0.5023	

Special Color Rendering Indices	
R1	82.3
R2	92
R3	95.9
R4	81
R5	82.5
R6	88.6
R7	84.9
R8	63.5
R9	8.8
R10	80.8
R11	80.1
R12	66.2
R13	85
R14	98.2
Rf	83
Rg	93

Table 2: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u' , v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

Goniophotometer Method

Test ambient temperature was 24.6°C.

The photometric distance is 30m.

Luminous data was taken at 0.5°vertical intervals and 10°horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.095
Power Factor	0.9863
Test Power (W)	11.24
Luminous Efficacy (lm/W)	127.8
Total Luminous Flux (lm)	1436.1
Beam Angle (°)	109.3 (0°-180°)/ 210.3 (90°-270°)
Center Beam Candle Power (cd)	253
Maximum Beam Candle Power (cd)	253.1 (At: C=290.0, Gamma=0.5)
Spacing Criteria	1.24 (0°-180°)/ 1.41 (90°-270°)
Zonal Lumens in the 0°-60°Zone	44.29%
Zonal Lumens in the 60°-90°Zone	26.69%
Zonal Lumens in the 90°-120°Zone	16.98%
Zonal Lumens in the 120°-180°Zone	12.04%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

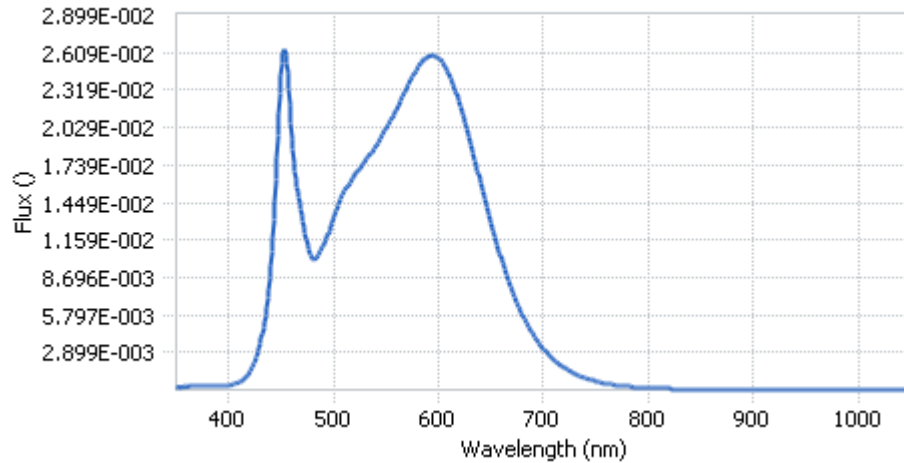
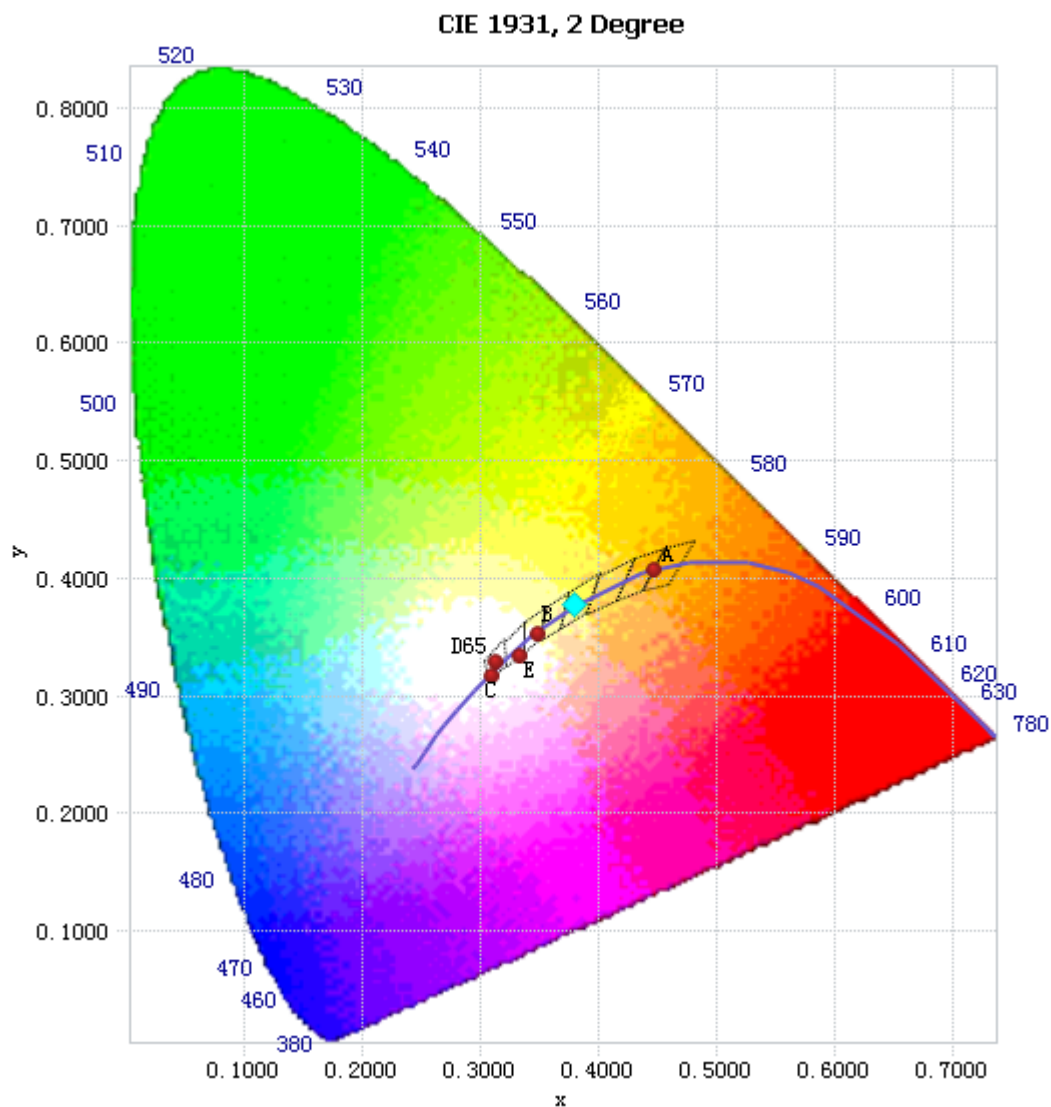


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.93E-04	485	1.04E-02	590	2.57E-02	695	3.70E-03
385	2.97E-04	490	1.11E-02	595	2.59E-02	700	3.16E-03
390	3.19E-04	495	1.21E-02	600	2.56E-02	705	2.71E-03
395	3.29E-04	500	1.33E-02	605	2.52E-02	710	2.32E-03
400	3.60E-04	505	1.44E-02	610	2.44E-02	715	1.97E-03
405	4.39E-04	510	1.53E-02	615	2.34E-02	720	1.70E-03
410	5.88E-04	515	1.60E-02	620	2.21E-02	725	1.46E-03
415	8.68E-04	520	1.67E-02	625	2.07E-02	730	1.24E-03
420	1.36E-03	525	1.71E-02	630	1.92E-02	735	1.06E-03
425	2.24E-03	530	1.77E-02	635	1.77E-02	740	8.97E-04
430	3.62E-03	535	1.82E-02	640	1.60E-02	745	7.70E-04
435	5.82E-03	540	1.89E-02	645	1.44E-02	750	6.57E-04
440	9.61E-03	545	1.96E-02	650	1.29E-02	755	5.67E-04
445	1.63E-02	550	2.02E-02	655	1.14E-02	760	4.91E-04
450	2.44E-02	555	2.09E-02	660	1.01E-02	765	4.24E-04
455	2.53E-02	560	2.18E-02	665	8.83E-03	770	3.60E-04
460	1.95E-02	565	2.26E-02	670	7.70E-03	775	3.14E-04
465	1.57E-02	570	2.34E-02	675	6.70E-03	780	2.69E-04
470	1.35E-02	575	2.42E-02	680	5.79E-03		
475	1.12E-02	580	2.49E-02	685	5.01E-03		
480	1.02E-02	585	2.55E-02	690	4.31E-03		

Table 4: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3797, 0.3785)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

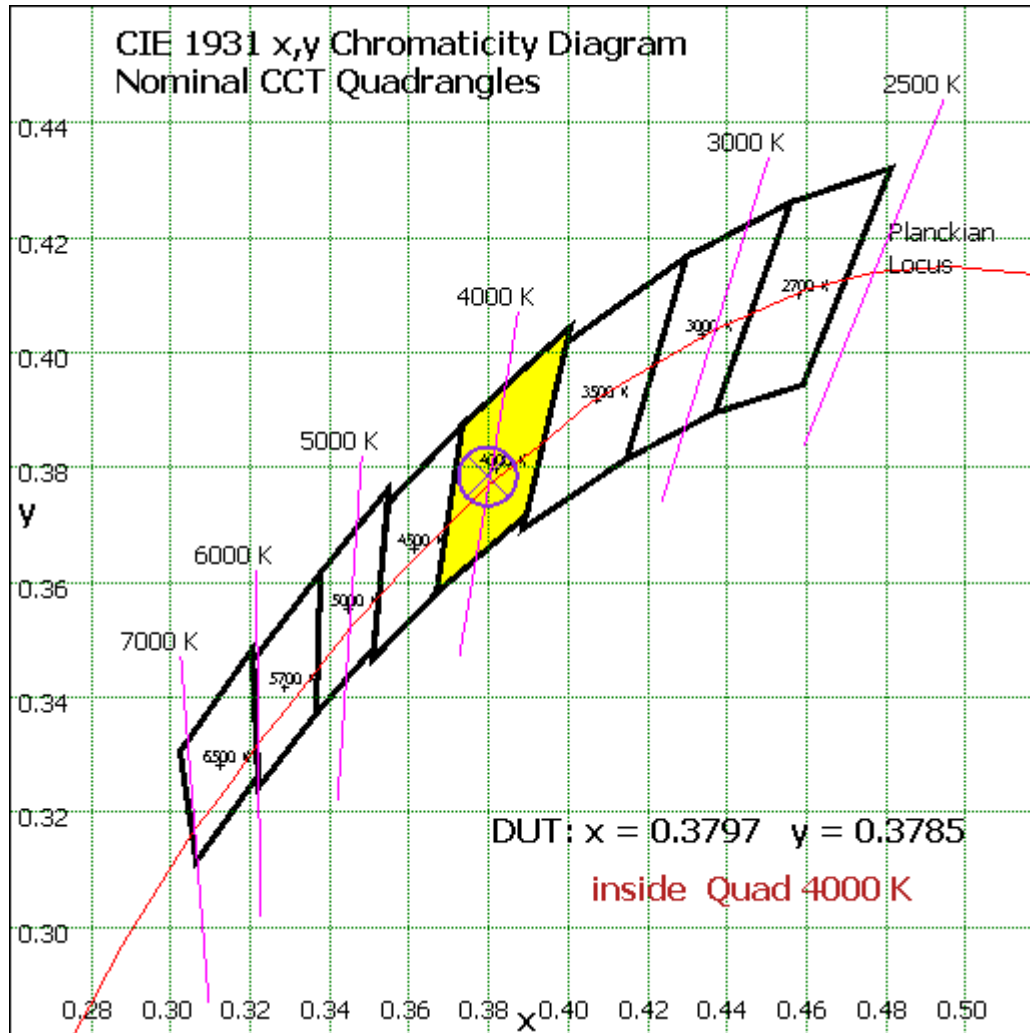


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	23.987	1.67%
10- 20	69.351	4.83%
20- 30	107.334	7.47%
30- 40	134.495	9.37%
40- 50	149.187	10.39%
50- 60	151.645	10.56%
60- 70	143.637	10.00%
70- 80	128.549	8.95%
80- 90	111.142	7.74%
90-100	95.623	6.66%
100-110	80.909	5.63%
110-120	67.275	4.68%
120-130	55.083	3.84%
130-140	44.147	3.07%
140-150	33.722	2.35%
150-160	23.539	1.64%
160-170	13.036	0.91%
170-180	3.408	0.24%
Total	1436.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	635.999	44.29%
60- 90	383.328	26.69%
0-90	1019.327	70.98%
90- 180	416.742	29.02%
0- 180	1436.1	100%

Table 5: Zonal Lumen Data

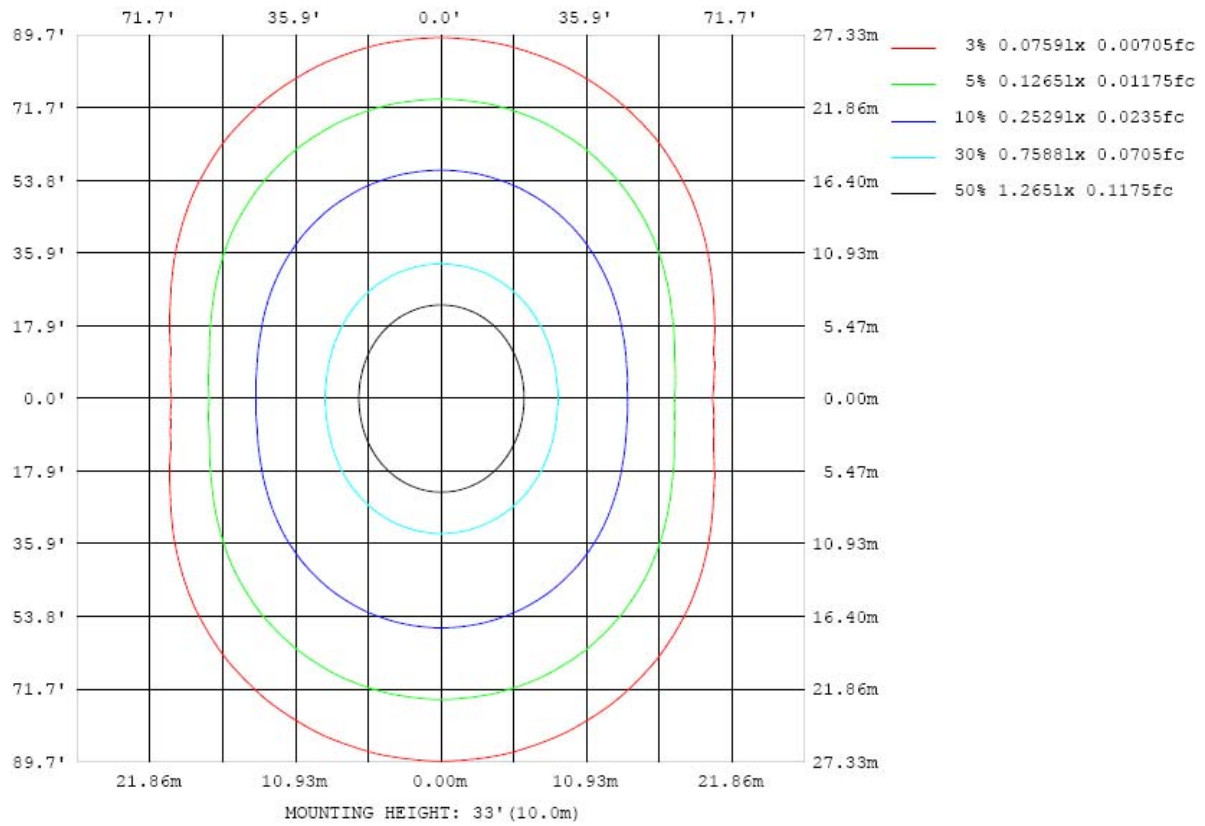


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

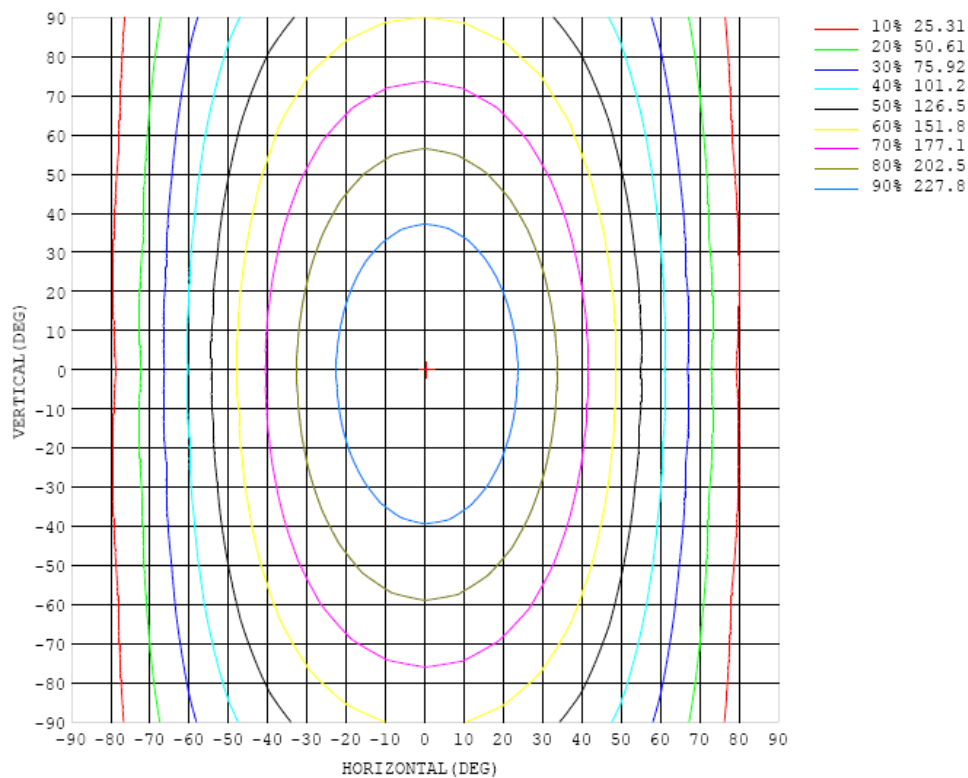


Chart 5: Isocandela Plot

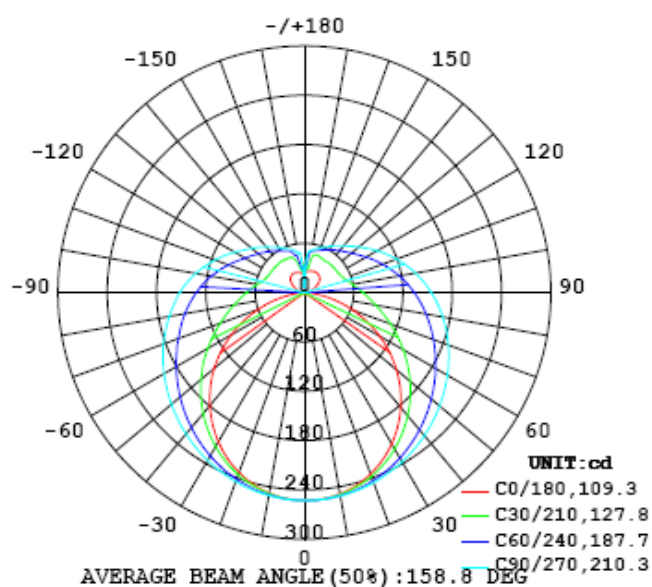


Chart 6: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253
5	252	252	252	252	252	252	253	253	253	253	253	253	252	252	252	252	252	252	252
10	249	249	249	249	250	250	251	251	251	251	251	251	250	250	249	249	248	248	248
15	243	243	244	245	246	247	248	249	249	249	249	248	247	246	245	243	242	242	241
20	235	235	237	238	240	242	244	245	246	246	246	244	243	241	238	236	234	233	233
25	225	225	227	230	233	236	238	241	242	242	241	240	237	234	231	227	225	223	222
30	212	213	216	220	224	228	232	235	237	238	237	234	231	226	222	217	213	210	210
35	198	200	203	208	214	220	225	230	232	233	231	228	224	218	212	205	200	196	195
40	182	184	189	196	203	211	218	223	226	227	226	222	216	209	201	193	186	181	179
45	165	167	173	182	192	201	210	216	220	221	219	215	208	199	189	179	170	164	162
50	146	149	157	168	180	192	201	209	213	215	213	208	200	189	177	165	154	146	144
55	126	130	140	153	168	182	193	201	207	208	206	200	191	179	165	151	137	127	124
60	106	110	123	139	156	171	184	194	199	201	199	193	183	170	154	137	120	107	103
65	84.2	90.0	105	125	144	162	176	186	192	194	191	185	174	160	142	123	103	87.5	81.7
70	63.1	70.1	88.9	111	133	152	167	178	184	186	184	177	166	151	132	110	87.3	68.1	60.2
75	41.9	51.5	73.8	99.1	123	143	159	170	177	179	176	169	158	142	122	98.2	72.8	50.2	39.5
80	22.8	34.8	61.0	88.2	113	134	150	162	169	171	168	161	149	133	112	87.7	60.7	34.3	20.6
85	7.65	22.0	50.6	79.0	104	125	142	154	161	163	160	153	141	125	104	78.9	50.9	22.5	6.19
90	0.57	15.0	43.0	71.1	96.3	117	134	145	152	154	152	145	133	117	96.2	71.4	43.8	16.1	0.42
95	1.37	12.2	37.7	64.9	89.0	110	126	137	144	146	144	137	125	109	89.2	65.5	38.8	13.6	1.57
100	3.66	12.5	34.2	59.1	82.0	102	117	128	135	137	135	128	117	102	82.5	60.0	35.4	14.1	3.58
105	6.83	14.3	32.4	54.6	75.6	94.3	109	120	126	128	126	120	109	94.5	76.3	55.7	33.8	16.2	6.23
110	10.2	16.9	32.1	51.1	70.1	87.3	101	111	117	119	117	111	101	87.7	70.9	52.3	33.9	19.1	9.41
115	13.9	20.1	32.8	48.9	65.8	80.9	93.7	103	109	111	109	103	93.9	81.3	66.6	50.4	34.9	21.9	12.4
120	17.6	23.1	34.0	47.7	62.1	75.1	86.5	95.1	100	102	100	95.3	86.9	75.6	63.1	49.4	36.4	24.9	15.7
125	21.2	26.1	35.3	47.2	59.3	70.5	80.1	87.6	92.2	93.9	92.4	87.8	80.5	71.1	60.5	48.9	37.8	28.2	18.8
130	24.3	29.0	36.6	47.0	57.2	67.0	74.9	81.1	85.0	86.4	85.2	81.4	75.3	67.7	58.5	48.9	38.4	31.9	21.9
135	26.0	31.2	37.7	46.9	55.6	63.8	70.3	75.6	78.9	80.1	79.0	75.9	70.8	64.5	56.9	48.8	38.7	35.2	24.0
140	27.3	33.5	39.5	46.7	54.3	61.0	66.7	70.6	73.4	74.4	73.6	71.0	67.2	61.9	55.7	48.0	39.6	38.1	25.8
145	28.2	35.1	41.9	46.0	52.8	58.6	63.2	66.7	68.8	69.5	69.5	67.2	63.8	59.6	54.4	47.3	43.8	40.8	26.8
150	28.5	37.9	43.1	46.3	51.0	56.0	60.2	63.0	64.8	65.4	64.9	63.5	61.0	57.5	52.3	47.1	46.0	42.7	27.0
155	28.4	40.3	43.6	47.3	49.5	53.6	57.3	59.8	61.1	61.6	61.3	60.1	57.7	54.5	49.9	49.3	47.1	44.8	26.8
160	27.9	37.1	44.2	48.1	50.2	52.2	54.7	56.8	57.9	58.2	57.8	56.3	53.9	53.0	52.0	49.8	47.0	42.7	26.1
165	27.5	30.7	37.6	47.8	49.9	51.6	53.2	54.1	55.0	55.2	55.0	54.6	53.9	51.3	46.8	42.4	39.4	36.3	25.1
170	26.4	27.0	28.5	35.7	46.3	49.8	51.0	51.7	52.4	52.7	52.7	52.1	45.3	38.9	35.9	34.3	33.0	29.8	23.9
175	30.2	29.9	29.0	29.2	32.9	32.6	35.7	44.6	48.3	49.9	41.6	29.4	28.1	32.0	31.3	33.5	31.2	31.5	28.7
180	6.39	6.38	6.38	6.37	6.36	6.35	6.34	6.32	6.31	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253		
5	251	252	252	252	252	252	252	252	252	252	253	252	252	252	252	252	252		
10	248	248	248	249	249	250	250	251	251	251	251	250	250	250	249	249	249		
15	242	242	243	244	245	246	247	248	248	248	248	247	246	245	244	243	243		
20	233	234	236	238	240	242	243	244	245	245	244	243	241	239	237	236	235		
25	223	224	227	230	233	236	238	240	241	240	239	237	234	231	229	227	225		
30	210	213	216	221	225	229	233	235	236	235	234	230	227	223	219	215	213		
35	196	200	205	211	217	222	226	229	230	230	227	223	218	213	207	202	199		
40	181	185	192	200	207	214	220	223	224	223	220	215	209	202	194	188	184		
45	164	170	178	188	198	206	212	217	218	217	213	207	199	190	181	173	167		
50	146	154	164	176	188	198	205	210	211	210	206	198	189	178	166	157	150		
55	127	137	150	164	178	189	197	203	205	203	198	189	179	166	153	140	131		
60	108	120	136	153	168	180	190	196	197	195	190	181	168	154	138	122	111		
65	87.7	103	122	142	158	172	182	188	190	188	182	172	159	143	124	105	90.7		
70	68.2	87.0	109	131	149	163	174	181	183	180	174	163	150	131	110	88.9	70.8		
75	49.7	72.3	97.4	121	140	156	166	173	175	173	166	155	140	121	98.3	73.9	52.1		
80	33.7	59.8	86.9	111	132	148	158	165	167	165	158	147	131	111	87.4	60.8	35.5		
85	21.8	50.0	78.0	103	124	140	151	157	159	157	151	139	123	103	78.1	50.4	22.9		
90	15.5	42.9	70.6	95.3	116	132	143	150	152	149	142	131	115	94.7	70.3	42.9	15.8		
95	12.6	37.7	64.1	88.1	108	124	135	141	144	141	134	123	107	87.3	63.6	37.3	12.3		
100	13.1	33.9	58.2	80.9	100	115	126	132	134	132	126	114	99.3	80.1	57.4	33.0	12.1		
105	15.5	32.6	53.4	74.4	92.5	107	117	123	125	123	117	106	91.5	73.3	52.3	31.1	14.4		
110	18.5	32.8	50.5	68.6	85.3	98.7	108	114	116	114	108	97.9	84.2	67.3	48.8	30.7	17.2		
115	21.8	34.1	48.9	64.4	78.6	90.8	99.8	105	107	105	99.3	89.9	77.5	62.7	46.7	31.4	20.4		
120	25.0	35.4	48.1	61.3	73.7	84.0	91.6	96.6	98.1	96.3	91.1	82.9	72.2	59.4	45.6	33.0	23.8		
125	27.8	36.2	47.8	59.0	69.6	78.5	85.0	89.2	90.4	88.8	84.4	77.4	68.1	57.0	45.3	33.8	27.0		
130	30.4	38.2	47.6	57.2	66.1	73.7	79.3	82.8	83.9	82.4	78.6	72.6	64.6	55.1	45.3	36.5	30.4		
135	32.7	39.9	47.0	55.5	63.1	69.4	74.1	77.2	78.0	76.8	73.5	68.3	61.7	53.6	44.9	38.5	33.7		
140	36.5	41.0	47.4	53.9	60.3	65.6	69.5	72.0	72.7	71.7	68.9	64.6	58.9	52.1	45.8	39.5	36.6		
145	39.0	41.3	47.6	52.6	57.8	62.2	65.3	67.3	67.8	67.0	64.6	61.1	56.2	51.2	46.4	41.5	38.8		
150	41.3	41.4	46.7	52.0	55.7	59.1	61.4	63.0	63.4	62.7	60.8	57.6	54.3	50.6	46.4	42.5	38.8		
155	41.1	44.0	46.8	49.2	54.2	56.4	58.2	59.3	59.6	59.1	57.6	55.8	53.2	50.2	47.3	44.7	39.2		
160	34.8	44.7	45.7	48.1	50.4	54.2	55.4	56.2	56.6	56.2	55.2	53.9	51.9	50.2	48.0	47.1	37.8		
165	27.3	35.3	40.3	42.1	47.5	47.2	51.2	53.6	53.7	53.2	52.3	51.8	50.8	49.9	49.2	44.8	33.2		
170	23.9	26.9	30.2	33.1	35.8	39.2	44.8	47.6	49.5	49.3	49.6	50.2	50.2	50.0	44.8	30.7	28.2		
175	28.6	28.3	28.3	31.2	29.5	30.7	26.6	27.4	37.3	49.1	46.4	40.8	33.4	31.1	31.2	28.2	29.0		
180	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.31	6.32	6.34	6.35	6.36	6.37	6.38	6.38		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	PF2010A	HZTE028-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	DPS1060	HZTE001-06	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	WY12010	HZTE004-03	Aug. 10, 2017	Aug. 09, 2018
Temperature recorder	JM624U	HZTE018-08	Aug. 17, 2017	Aug. 16, 2018
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 16, 2017	Aug. 15, 2018
Standard source	D908	HZTE012-01	Aug. 20, 2017	Aug. 19, 2018
Integrate Sphere system	2M	HZTE015-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	WT210	HZTE008-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	PCR 500L	HZTE001-07	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	IT6154	HZTE004-04	Aug. 10, 2017	Aug. 09, 2018
Standard source	SCL-1400	HZTE012-02	Aug. 20, 2017	Aug. 19, 2018
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 16, 2017	Aug. 15, 2018
Temperature Meter	TES1310	HZTE017-01	Aug. 17, 2017	Aug. 16, 2018

Table 8: Test Equipment List

TEST METHODS

Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning. Therefore, no seasoning was performed.

Sphere-Spectroradiometer Method- Photometric and Electrical Measurements

A Labsphere Model CDS 2100 Spectroradiometer and Two Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit. The coating reflectance of each sphere is 98%. The measure geometry is 4π . Self-absorption correction is conducted in testing. Bandwidth of spectroradiometer is 350nm-1050nm.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.

The standard reference of the integrated sphere system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Standards and Technology.

The uncertainty of integrating sphere system reported in this document is expanded uncertainty is 2.1% with a coverage factor $k=2$.

Goniophotometer Method

Photometric and Electrical Measurements

An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.

Ambient temperature was measured at the same height of the sample mounted on the Goniophotometer equipment. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Everfine Digital Power Meter.

Some graphics were created with Photometric Plus software.

The standard reference of the Goniophotometer system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.

The uncertainty of goniophotometer system reported in this document is expanded uncertainty is 2.3% with a coverage factor $k=2$.

Color Characteristics Measurements

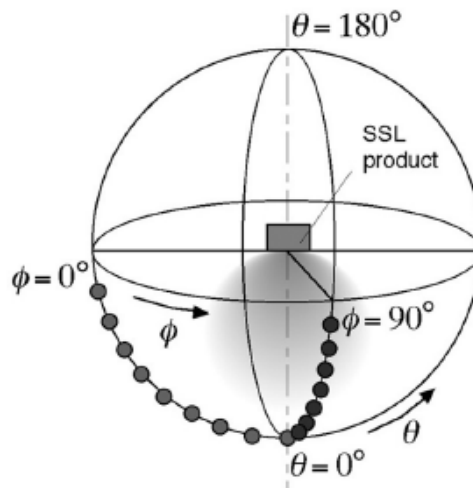
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average, weighted to intensity, over the angular range where light is intentionally emitted from the SSL product. The color characteristics measurements are using gonio-spectroradiometer.

Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes ($C=0^\circ/180^\circ$ and $C=90^\circ/270^\circ$) and at 10° or less intervals for vertical angle until the light output dropped to below 10% of the peak intensity. The averaged weighted chromaticity coordinate

was calculated from these points. The data was then analyzed to check for delta color differences of the u' , v' chromaticity coordinates. The spatial non-uniformity of chromaticity, $\Delta u'v'$, is determined as the maximum deviation (distance on the CIE (u' , v') diagram) among all measured points from the spatially averaged chromaticity coordinate.

The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



*** End of Report ***

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