LM-79-08 Test Report

for

GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

LED Tube

Model: 12T8/3F/830/DEB/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18120037b

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

Review by: April Zou

Engineer: April Zou

Jan. 09, 2019

Approved by: Jim Zhang

Manager: Jim Zhang

Jan. 09, 2019

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: **12T8/3F/830/DEB/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
125.8	1458.0	11.59	0.9836

CCT (K)	CRI	Stabilization Time (Light & Power)
3079	81.8	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	: Dec. 26, 2018
Date of Test	: Dec. 27, 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 Photos

Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: LED Tube
Model	: 12T8/3F/830/DEB/R
Electrical Ratings	: 120-277V, 50/60Hz, 12W
Product Description	: G13 base, 3000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 25.2℃.

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 70 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.098	0.046
Power Factor	0.9836	0.9407
Test Power (W)	11.59	11.93
THD A%	17.22	17.31
Luminous Efficacy (lm/W)	125.8	123.9
Total Luminous Flux (lm)	1458.0	1478.0
Color Rendering Index (CRI)	81.8	
R9	3.3	
Correlated Color Temperature (CCT)(K)	3079	
Chromaticity Chroma x	0.4311	
Chromaticity Chroma y	0.4017	
Chromaticity Chroma u	0.2478	
Chromaticity Chroma v	0.3464	
Duv	0.0007	
Chromaticity Chroma u ’	0.2478	
Chromaticity Chroma v’	0.5196	

Special Color Rendering Indices	
R1	80.1
R2	91.4
R3	95.1
R4	78.8
R5	80.6
R6	89.5
R7	81.6
R8	57.2
R9	3.3
R10	80.5
R11	77.7
R12	71.9
R13	82.9
R14	97.9
Rf	83
Rg	95

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 24.9℃.

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)	0.099
Power Factor	0.9840
Test Power (W)	11.69
Luminous Efficacy (lm/W)	122.9
Total Luminous Flux (lm)	1436.7
Beam Angle (°)	152.5
Center Beam Candle Power (cd)	261
Spacing Criteria	1.23 (0 °-180 °)/ 1.39 (90 °-270 °)
Zonal Lumens in the 0 °-60 °Zone	45.10%
Zonal Lumens in the 60 °-90 °Zone	26.40%
Zonal Lumens in the 90 °-120 °Zone	16.51%
Zonal Lumens in the 120 °-180 °Zone	11.99%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

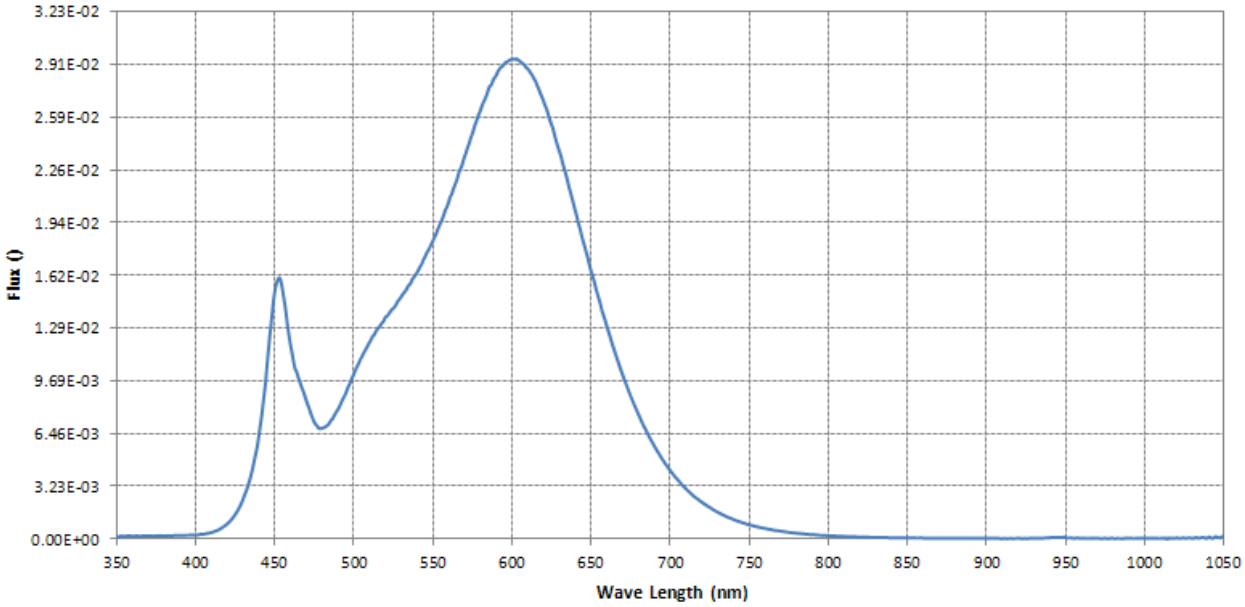
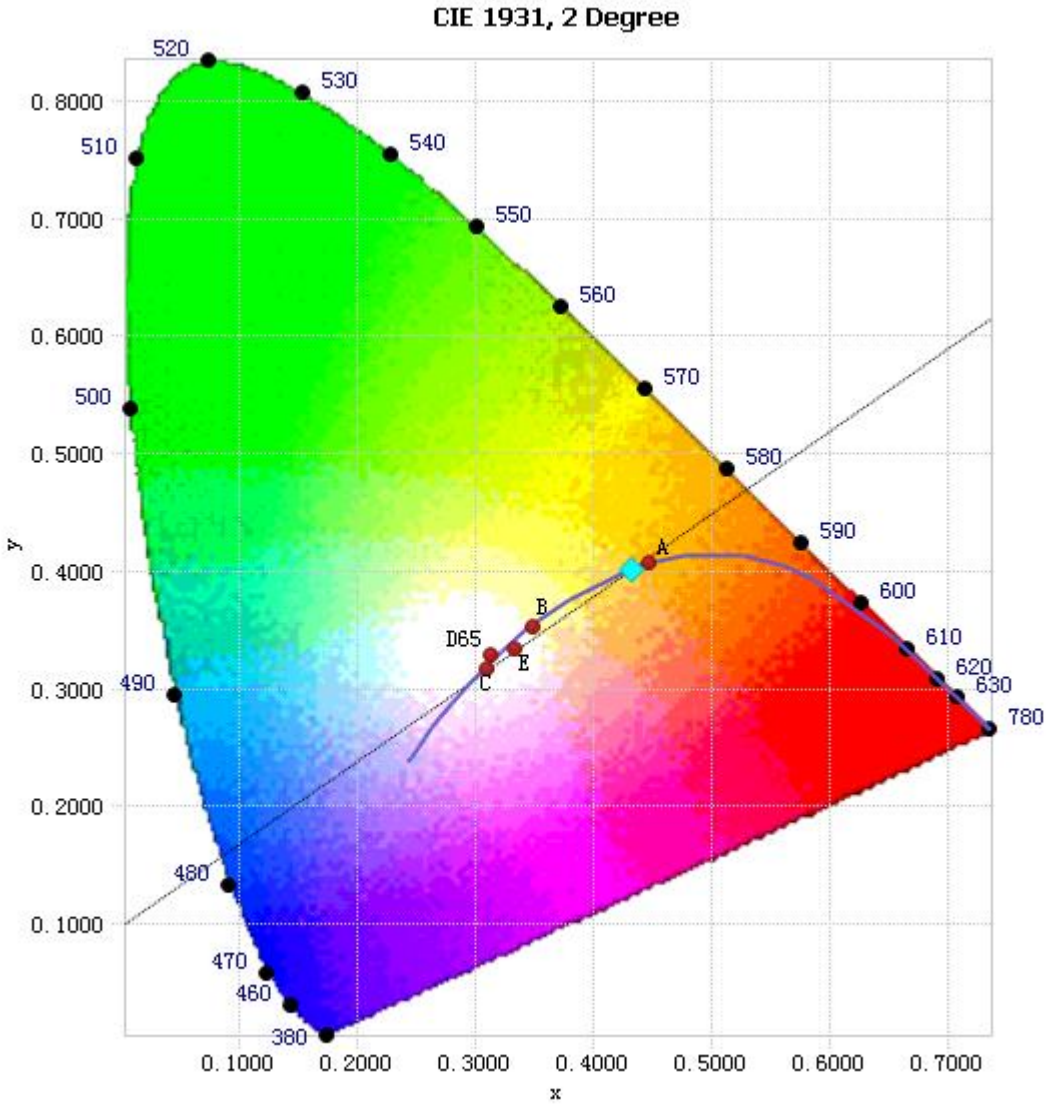


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.00E-04	485	7.16E-03	590	2.84E-02	695	4.90E-03
385	1.97E-04	490	7.92E-03	595	2.91E-02	700	4.21E-03
390	2.11E-04	495	8.90E-03	600	2.94E-02	705	3.61E-03
395	2.27E-04	500	1.01E-02	605	2.93E-02	710	3.08E-03
400	2.40E-04	505	1.11E-02	610	2.88E-02	715	2.63E-03
405	2.89E-04	510	1.20E-02	615	2.81E-02	720	2.26E-03
410	3.93E-04	515	1.29E-02	620	2.69E-02	725	1.95E-03
415	5.70E-04	520	1.36E-02	625	2.54E-02	730	1.65E-03
420	9.10E-04	525	1.41E-02	630	2.38E-02	735	1.40E-03
425	1.47E-03	530	1.48E-02	635	2.20E-02	740	1.20E-03
430	2.40E-03	535	1.56E-02	640	2.02E-02	745	1.02E-03
435	3.86E-03	540	1.63E-02	645	1.83E-02	750	8.75E-04
440	6.25E-03	545	1.72E-02	650	1.64E-02	755	7.54E-04
445	1.03E-02	550	1.82E-02	655	1.47E-02	760	6.48E-04
450	1.50E-02	555	1.94E-02	660	1.31E-02	765	5.48E-04
455	1.53E-02	560	2.06E-02	665	1.15E-02	770	4.77E-04
460	1.19E-02	565	2.19E-02	670	1.01E-02	775	4.02E-04
465	9.89E-03	570	2.34E-02	675	8.78E-03	780	3.54E-04
470	8.51E-03	575	2.48E-02	680	7.64E-03		
475	7.18E-03	580	2.62E-02	685	6.62E-03		
480	6.78E-03	585	2.75E-02	690	5.71E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y) : (0.4311,0.4017)

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

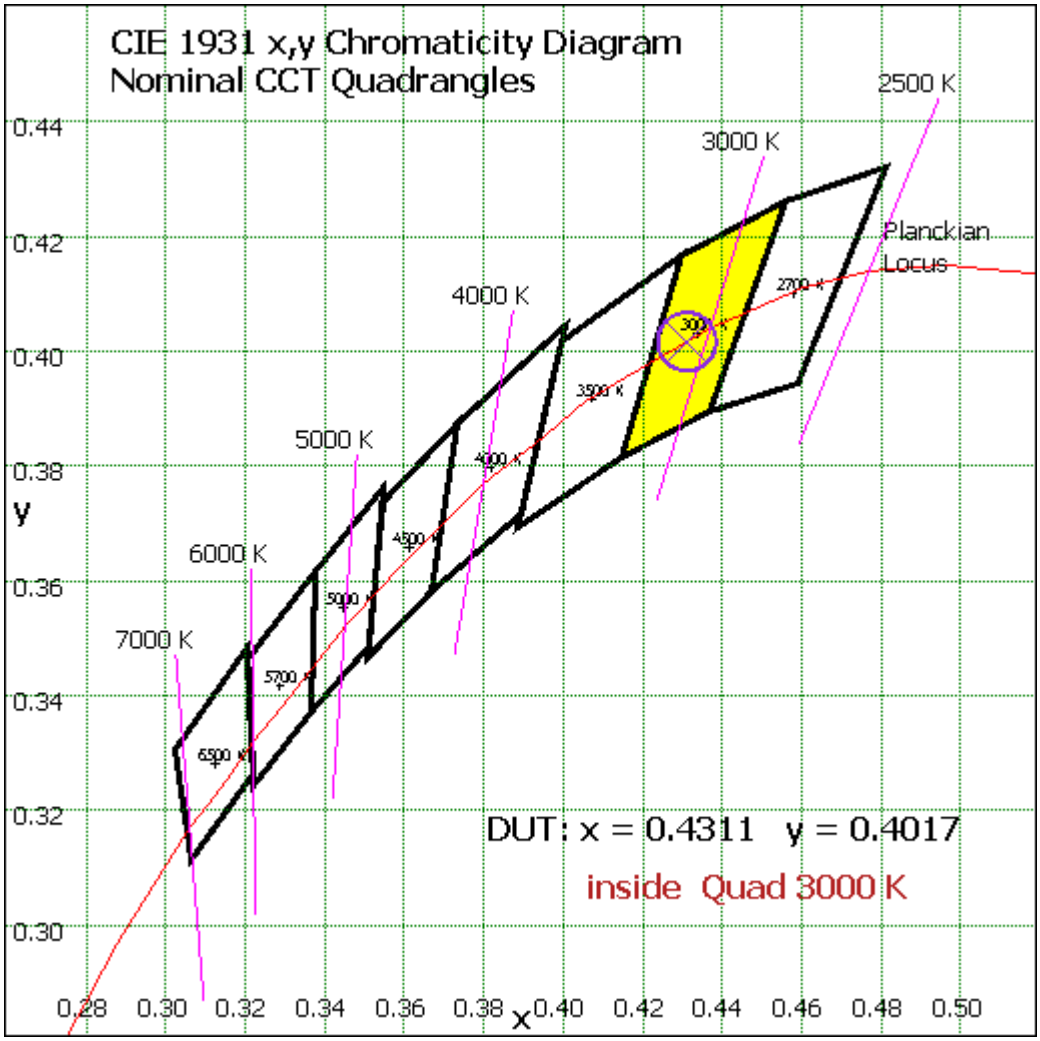


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	24.736	1.72%
10- 20	71.408	4.97%
20- 30	110.187	7.67%
30- 40	137.406	9.56%
40- 50	151.421	10.54%
50- 60	152.719	10.63%
60- 70	143.364	9.98%
70- 80	127.089	8.85%
80- 90	108.884	7.58%
90-100	93.122	6.48%
100-110	78.608	5.47%
110-120	65.509	4.56%
120-130	53.962	3.76%
130-140	43.753	3.05%
140-150	33.932	2.36%
150-160	23.993	1.67%
160-170	13.223	0.92%
170-180	3.366	0.23%
Total	1436.7	100%

γ(°)	Lumens	% Total
0- 60	647.877	45.10%
60- 90	379.337	26.40%
0-90	1027.214	71.50%
90- 180	409.468	28.50%
0- 180	1436.7	100%

Table 5: Zonal Lumen Data

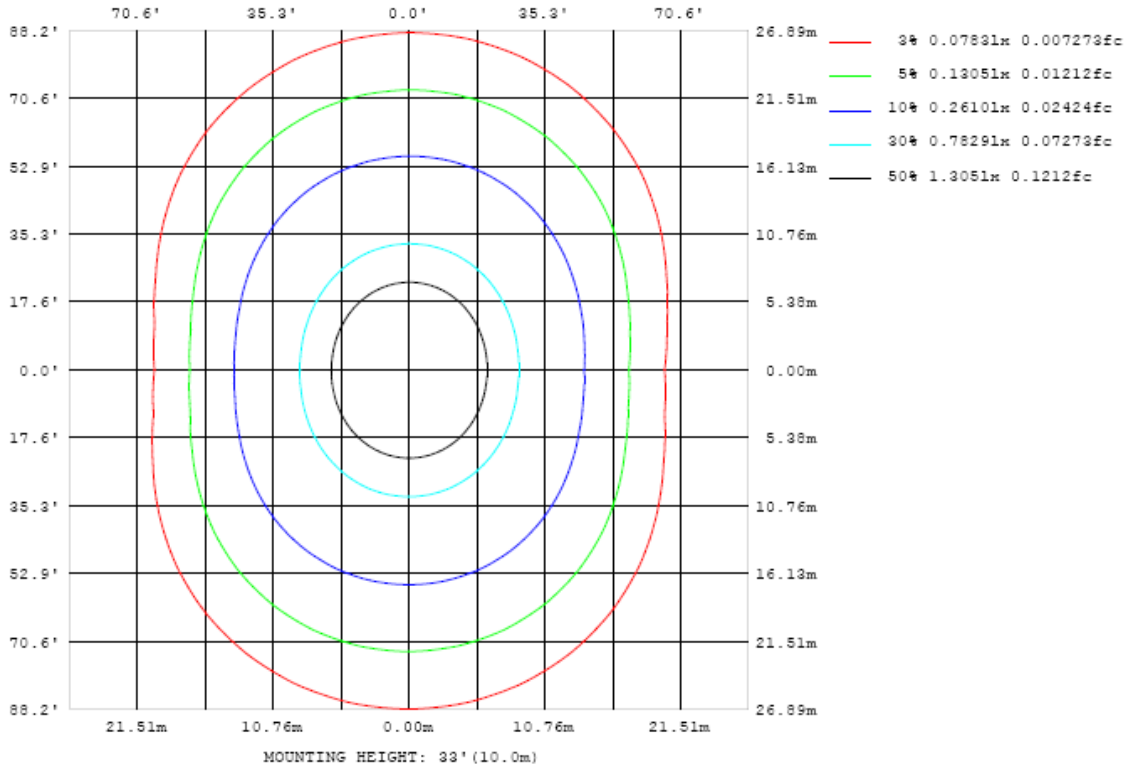


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

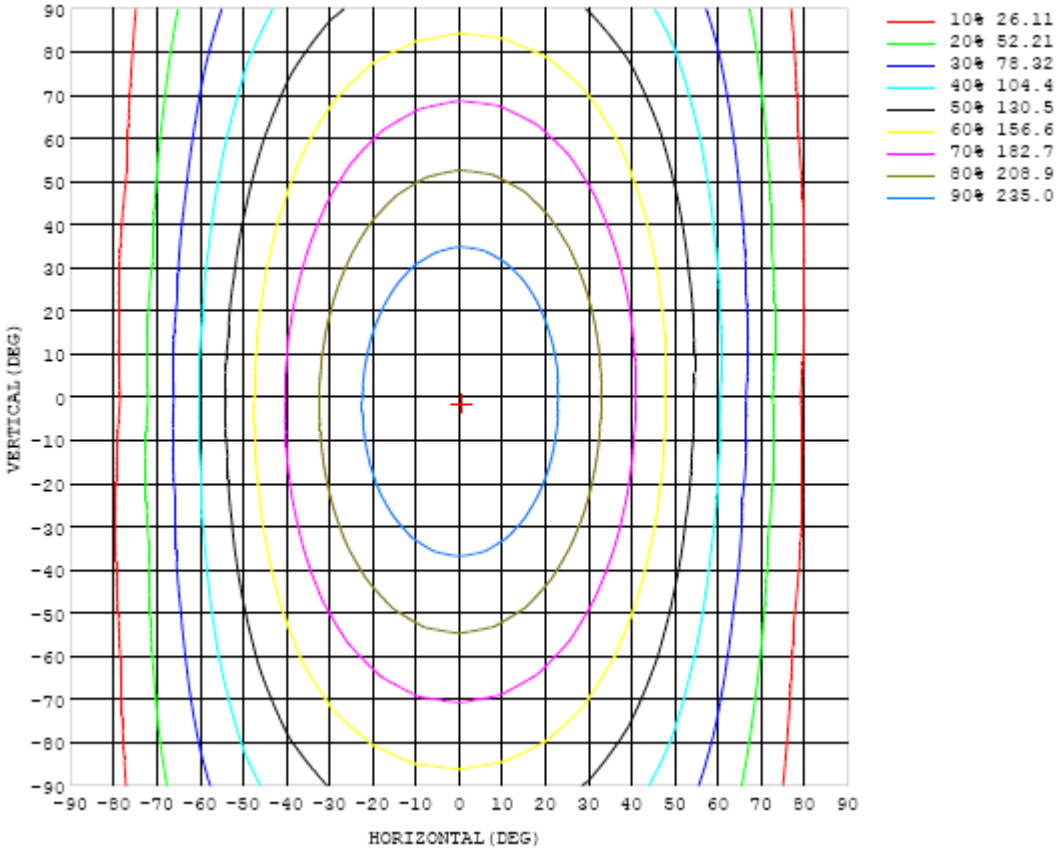


Chart 5: Isocandela Plot

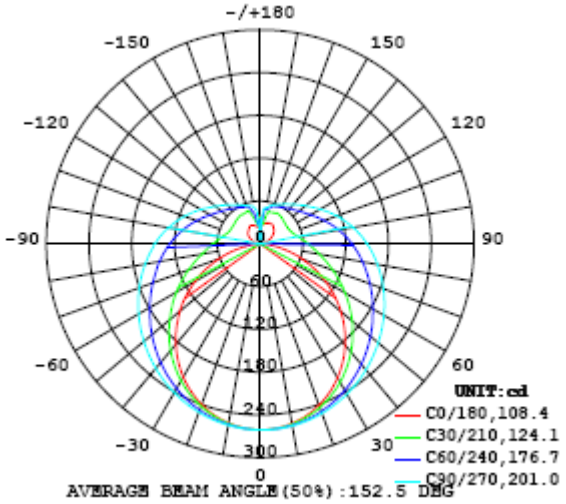


Chart 6: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261
5	260	260	260	260	260	260	261	261	261	261	261	261	260	260	260	260	260	260	259
10	256	256	257	257	257	258	259	259	259	259	259	259	258	258	257	256	256	256	255
15	250	250	251	252	253	254	255	256	257	257	257	256	255	254	252	251	250	249	249
20	241	242	243	244	246	248	250	252	253	253	253	252	250	248	246	244	242	241	240
25	230	231	233	235	238	241	244	247	248	249	248	247	244	241	238	234	232	230	229
30	217	218	221	224	229	233	237	241	243	243	243	240	237	233	228	224	220	217	216
35	202	203	207	212	218	224	229	234	236	237	236	234	229	224	217	211	206	202	201
40	185	187	192	198	206	214	221	226	230	231	230	226	221	214	206	198	191	186	184
45	167	169	175	184	193	203	212	218	222	224	222	218	212	203	194	184	175	168	166
50	148	150	158	168	180	192	202	210	214	216	215	210	202	193	181	169	158	150	147
55	127	131	140	153	167	181	192	201	206	208	207	202	193	182	169	154	141	130	127
60	106	110	122	138	154	170	183	192	198	200	199	193	184	171	156	139	123	110	105
65	84.5	89.5	104	123	142	159	173	184	190	192	190	185	175	161	144	125	106	89.8	83.3
70	63.0	69.0	86.8	109	130	149	164	175	182	184	182	176	166	151	133	112	89.8	70.2	61.3
75	42.2	50.2	71.1	95.8	119	139	155	166	173	176	174	167	157	142	123	100	75.2	52.3	40.0
80	22.9	33.0	58.0	84.6	109	130	146	158	165	167	165	159	148	133	113	89.5	63.2	36.6	21.0
85	7.78	19.9	47.3	74.9	100	121	137	149	156	159	157	150	140	124	105	80.5	53.4	24.9	6.39
90	0.76	12.7	39.6	67.1	91.9	113	129	140	147	150	148	142	131	116	96.7	72.9	46.1	18.4	0.52
95	1.33	9.86	34.2	60.8	84.4	105	120	132	139	141	140	134	123	109	89.4	66.5	40.8	15.3	1.52
100	3.76	10.5	30.6	55.0	77.3	96.6	112	123	130	132	131	125	115	101	82.4	61.1	37.0	15.6	3.82
105	7.00	13.0	29.3	50.4	70.9	89.1	104	114	121	123	122	116	107	93.2	76.0	56.3	35.1	17.3	6.80
110	10.7	16.5	29.4	47.4	65.8	82.0	95.8	106	112	114	113	108	98.6	86.2	70.3	52.7	35.2	20.3	10.4
115	14.6	20.5	30.5	45.7	61.6	75.8	88.3	97.6	103	106	104	99.5	91.2	79.8	65.9	51.0	36.0	23.9	13.8
120	18.4	24.4	32.4	44.9	58.6	70.6	81.5	90.0	95.2	97.3	96.2	91.8	84.2	74.2	63.0	49.8	37.4	27.4	17.1
125	22.0	27.0	34.9	44.7	56.3	66.3	76.0	83.1	87.6	89.5	88.5	84.7	78.4	70.1	60.4	49.4	39.0	30.9	20.0
130	24.9	29.8	37.6	45.2	54.7	63.9	71.4	77.5	81.4	83.1	82.2	79.0	73.7	66.8	58.5	49.4	40.8	33.5	22.8
135	27.2	31.6	40.2	46.3	53.6	61.3	67.4	72.6	75.9	77.3	76.6	74.0	69.5	64.0	56.9	49.5	42.8	36.1	23.9
140	29.4	33.6	42.5	47.4	53.1	59.1	64.5	68.3	71.1	72.2	71.7	69.5	66.2	61.5	55.8	49.9	44.5	37.6	25.3
145	31.4	35.0	41.9	48.5	52.8	57.4	61.7	65.1	66.4	67.7	67.3	66.0	63.0	59.3	54.8	50.3	45.9	39.2	27.1
150	32.0	35.8	43.1	49.5	52.7	56.0	59.3	61.9	63.5	64.2	64.0	62.6	60.4	57.5	54.2	50.8	46.2	42.7	28.8
155	31.8	37.6	43.1	47.3	52.7	55.0	57.3	59.1	60.3	60.8	60.6	59.7	58.1	56.1	53.7	50.5	46.3	43.5	28.9
160	30.8	31.4	43.7	46.9	49.6	54.1	55.7	56.9	57.6	58.0	57.9	57.3	56.2	54.9	52.4	49.7	45.6	39.9	27.7
165	29.9	29.8	35.0	47.3	47.8	50.3	51.4	53.9	55.1	55.6	55.5	55.1	54.1	51.1	46.8	41.8	39.3	33.3	26.3
170	28.3	28.5	27.5	32.2	45.0	48.9	49.0	49.7	50.5	51.2	51.5	51.1	45.2	39.1	36.4	33.4	28.9	26.1	24.1
175	32.1	31.7	30.5	28.1	31.2	31.7	34.1	39.6	44.7	46.5	38.3	25.3	23.6	26.9	26.5	29.2	26.0	24.3	27.9
180	3.61	3.59	3.53	3.44	3.31	3.16	2.98	2.79	2.59	2.39	2.43	2.46	2.50	2.54	2.58	2.61	2.63	2.65	2.66

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	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261	261		
5	259	259	259	260	260	260	260	260	260	260	260	260	260	260	260	260	260		
10	255	256	256	256	257	257	258	258	258	258	258	258	257	257	257	256	256		
15	249	249	250	251	252	254	254	255	255	255	255	254	253	252	251	251	250		
20	240	241	243	244	246	248	250	251	251	251	251	249	248	246	244	243	242		
25	229	231	233	236	239	242	244	246	247	246	245	243	240	238	235	233	231		
30	216	219	222	226	230	234	238	240	241	241	239	236	232	228	224	221	218		
35	202	205	209	215	221	226	230	233	235	234	232	228	223	217	212	207	204		
40	185	189	196	203	210	217	223	226	228	227	224	219	213	206	198	192	188		
45	168	173	181	190	200	208	214	219	221	220	216	210	202	193	184	176	170		
50	149	156	166	177	189	198	206	211	213	212	208	201	192	181	169	159	152		
55	130	139	151	164	177	189	197	203	205	204	199	192	181	168	155	143	133		
60	109	120	136	151	166	179	188	195	197	196	191	182	170	156	141	125	113		
65	88.1	102	121	140	156	170	180	186	189	187	182	173	160	144	126	108	92.5		
70	67.6	85.3	107	128	146	160	171	178	181	179	173	164	150	133	113	91.2	72.7		
75	48.3	69.7	94.2	117	137	151	162	170	172	171	165	155	141	122	100	76.1	54.0		
80	31.5	56.5	83.1	107	127	143	154	161	164	162	156	147	132	112	89.1	63.0	37.7		
85	19.1	46.3	73.8	98.3	119	135	147	153	155	154	148	138	123	103	79.6	52.5	25.1		
90	12.7	39.1	66.3	90.6	111	127	138	145	148	146	140	130	115	95.2	71.7	44.9	17.7		
95	10.5	34.3	60.1	83.5	103	119	130	137	140	138	132	122	107	87.9	65.0	39.3	14.2		
100	11.3	31.2	54.8	76.9	95.8	111	122	128	131	129	123	113	99.1	80.8	59.0	35.1	13.5		
105	13.8	30.1	50.5	70.9	88.6	103	113	119	122	120	115	105	91.5	74.3	54.0	32.7	15.0		
110	17.5	30.6	47.7	65.6	81.9	95.1	105	111	113	111	106	97.1	84.4	68.4	50.1	32.1	18.0		
115	21.2	32.1	46.3	61.5	75.8	87.9	96.8	102	104	103	98.0	89.6	77.8	63.4	47.7	32.4	21.6		
120	24.7	34.0	45.8	58.6	70.8	81.1	89.2	94.3	96.2	94.9	90.2	82.5	72.1	59.8	46.4	33.7	25.4		
125	28.0	36.2	45.9	56.6	66.9	75.7	82.5	86.8	88.4	87.2	83.1	76.6	67.8	57.2	45.9	35.9	29.0		
130	31.7	38.5	46.4	55.1	63.8	71.2	77.0	80.6	81.9	80.8	77.4	71.8	64.3	55.4	46.1	38.3	32.4		
135	35.2	40.7	47.1	54.2	61.2	67.4	72.2	75.2	76.3	75.4	72.4	67.7	61.5	54.1	46.8	40.7	35.5		
140	38.4	42.6	47.9	53.5	59.1	64.0	68.0	70.5	71.4	70.6	68.1	64.2	59.2	53.4	47.8	43.0	38.4		
145	41.1	43.8	48.6	52.9	57.3	61.2	64.3	66.3	67.0	66.4	64.4	61.3	57.4	53.0	48.7	45.0	40.9		
150	43.5	45.3	47.6	52.6	55.8	58.8	61.1	62.7	63.2	62.7	61.2	59.0	56.0	52.7	49.6	46.9	42.4		
155	42.6	46.8	48.6	50.7	54.6	56.7	58.4	59.5	60.0	59.6	58.6	57.0	55.0	52.7	50.6	48.6	43.7		
160	34.8	45.7	49.2	49.7	51.8	55.0	56.1	56.9	57.3	57.1	56.5	55.6	54.3	52.8	51.5	50.1	41.8		
165	28.4	34.8	40.0	43.5	48.5	49.9	54.2	54.8	55.1	55.1	54.8	54.4	53.7	52.8	52.0	49.0	35.7		
170	24.4	27.0	29.5	32.7	35.1	39.3	43.8	50.9	51.7	53.4	53.3	53.1	52.7	52.1	48.8	35.9	28.4		
175	27.8	28.9	28.8	31.2	27.9	28.7	24.6	24.9	35.0	46.5	46.0	43.1	36.1	32.5	32.5	29.8	29.3		
180	2.65	2.63	2.61	2.58	2.54	2.50	2.46	2.43	2.39	2.59	2.79	2.98	3.16	3.31	3.44	3.53	3.59		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 14, 2018	Aug. 13, 2019
Digital Power Meter	PF2010A	HZTE028-01	Sep. 12, 2018	Sep. 11, 2019
AC Power Supply	DPS1060	HZTE001-06	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	WY12010	HZTE004-03	Aug. 09, 2018	Aug. 08, 2019
Temperature recorder	JM624U	HZTE018-08	Aug. 09, 2018	Aug. 08, 2019
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 09, 2018	Aug. 08, 2019
Standard source	D908	HZTE012-01	Aug. 14, 2018	Aug. 13, 2019
Integrate Sphere system	3M	HZTE015-04	Aug. 16, 2018	Aug. 15, 2019
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2018	Aug. 01, 2019
AC Power Supply	PCR 500L	HZTE001-07	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	IT6154	HZTE004-04	Aug. 09, 2018	Aug. 08, 2019
Standard source	SCL-1400	HZTE012-02	Aug. 16, 2018	Aug. 15, 2019
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 09, 2018	Aug. 08, 2019
Temperature Meter	TES1310	HZTE017-01	Aug. 09, 2018	Aug. 08, 2019

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 expended 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 expended uncertainty is 2.3% with a coverage factor k=2.

Color Characteristics Measurements

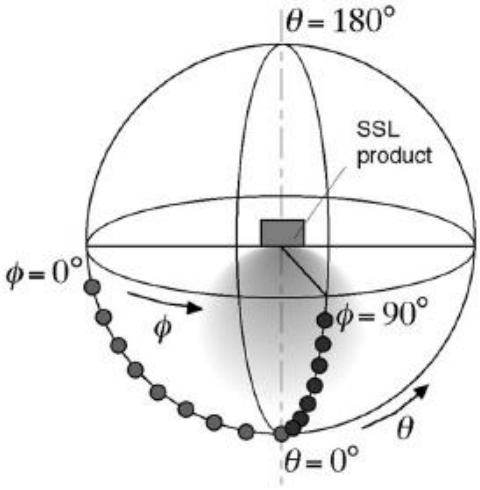
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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°/180° and C=90°/270°) 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, Δu'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 ***