LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

LED Lamp

Model: 24HID/830/277V/EX39/SD

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist, Hangzhou, Zhejiang Province, China 311100

Tel: +86571 86376106

www.ledtestlab.com

Report No.: HZ21120007z

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

Review by: Engineer: April Zou

Dec. 16, 2021

Approved by: Manager: Jim Zhang

Dec. 16, 2021

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: **24HID/830/277V/EX39/SD**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
138.2	3263.4	23.61	0.9847

CCT (K)	CRI	Stabilization Time (Light & Power)
3016	82.3	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. 03, 2021
Date of Test	: Dec. 07, 2021
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 ANSI/IES TM-30-18 IES Method for Evaluating Light Source Color Rendition

TABLE OF CONTENT

SAMPLE PHOTO

Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Lamp
Model	: 24HID/830/277V/EX39/SD
Electrical Ratings	: 120-277V, 50/60Hz, 24W
Product Description	: 3000K
Manufacturer	: GREEN CREATIVE LTD
Address	: Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

TEST RESULTS

Test ambient temperature was 26.0 ℃.

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)	0.200	0.094
Power Factor	0.9847	0.9158
Test Power (W)	23.61	23.84
THD A%	8.05	12.27
Luminous Efficacy (lm/W)	138.2	137.4
Total Luminous Flux (lm)	3263.4	3276.4
Color Rendering Index (CRI)	82.3	
R9	4.4	
Correlated Color Temperature (CCT)(K)	3016	
Chromaticity Chroma x	0.4355	
Chromaticity Chroma y	0.4034	
Chromaticity Chroma u	0.2500	
Chromaticity Chroma v	0.3473	
Duv	-0.0001	
Chromaticity Chroma u ’	0.2500	
Chromaticity Chroma v’	0.5209	

Special Color Rendering Indices	
R1	80.4
R2	90.2
R3	96.6
R4	80.9
R5	80.9
R6	88.4
R7	82.6
R8	58.2
R9	4.4
R10	78.1
R11	80.8
R12	72.7
R13	82.7
R14	98.7

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 25.1 ℃.

The photometric distance is 30 m.

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)	0.202
Power Factor	0.9853
Power (W)	23.84
Luminous Efficacy (lm/W)	139.8
Total Luminous Flux (lm)	3332.0
Beam Angle (°)	227.5 (0^o-180^o) / 225.5 (90^o-270^o)
Center Beam Candle Power (cd)	397
Maximum Beam Candle Power (cd)	406.9 (At: C=140.0, Gamma=33.0)
Spacing Criteria	1.55 (0^o-180^o) / 1.49 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	36.64%
Zonal Lumens in the 60 °-90 °Zone	30.97%
Zonal Lumens in the 90 °-120 °Zone	21.97%
Zonal Lumens in the 120 °-180 °Zone	10.42%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

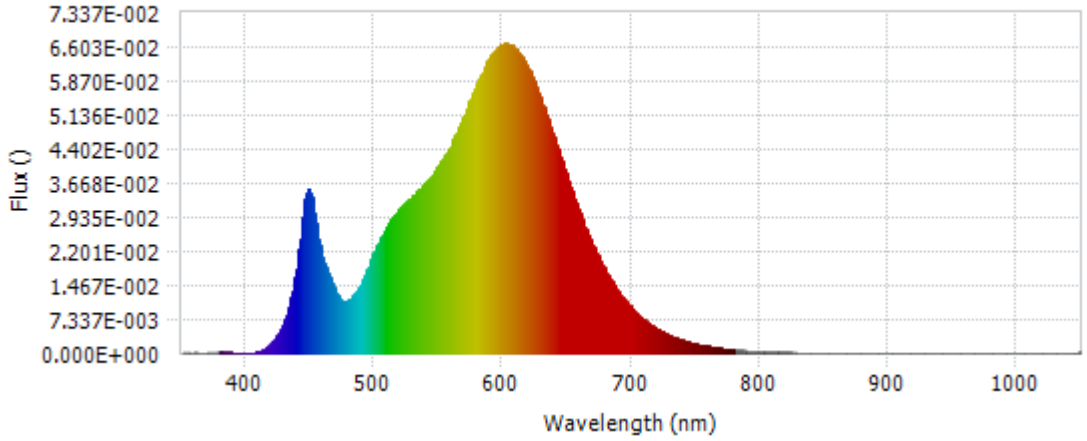
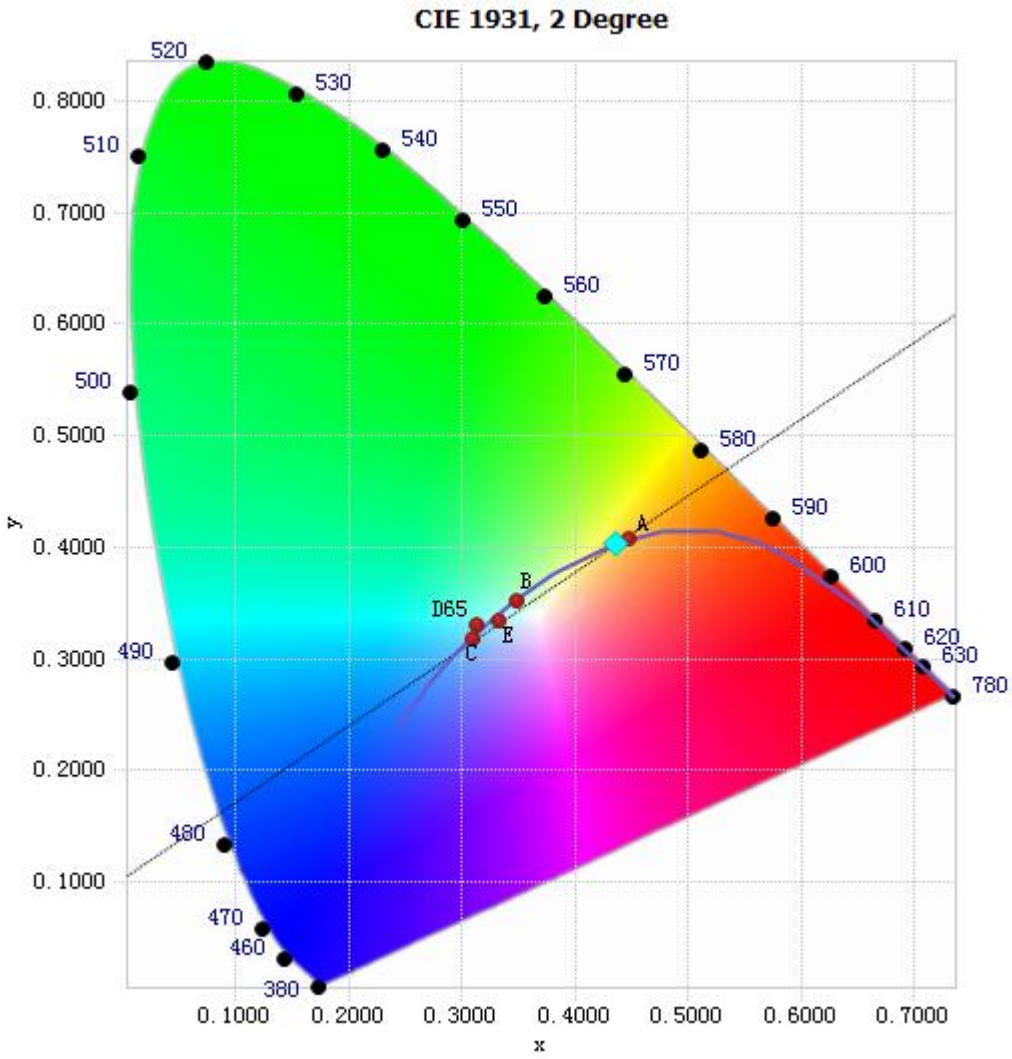


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.26E-04	485	1.30E-02	590	6.38E-02	695	1.15E-02
385	1.78E-04	490	1.55E-02	595	6.56E-02	700	9.89E-03
390	1.73E-04	495	1.87E-02	600	6.64E-02	705	8.46E-03
395	1.53E-04	500	2.20E-02	605	6.65E-02	710	7.25E-03
400	1.10E-04	505	2.50E-02	610	6.55E-02	715	6.25E-03
405	2.05E-04	510	2.74E-02	615	6.39E-02	720	5.37E-03
410	4.38E-04	515	2.96E-02	620	6.11E-02	725	4.59E-03
415	1.11E-03	520	3.13E-02	625	5.80E-02	730	3.88E-03
420	2.38E-03	525	3.27E-02	630	5.45E-02	735	3.33E-03
425	4.30E-03	530	3.40E-02	635	5.06E-02	740	2.82E-03
430	7.24E-03	535	3.53E-02	640	4.65E-02	745	2.40E-03
435	1.20E-02	540	3.68E-02	645	4.23E-02	750	2.07E-03
440	2.01E-02	545	3.86E-02	650	3.82E-02	755	1.76E-03
445	3.16E-02	550	4.04E-02	655	3.41E-02	760	1.52E-03
450	3.45E-02	555	4.26E-02	660	3.03E-02	765	1.30E-03
455	2.62E-02	560	4.52E-02	665	2.67E-02	770	1.10E-03
460	2.02E-02	565	4.81E-02	670	2.34E-02	775	9.53E-04
465	1.66E-02	570	5.14E-02	675	2.05E-02	780	8.27E-04
470	1.29E-02	575	5.48E-02	680	1.78E-02		
475	1.12E-02	580	5.83E-02	685	1.55E-02		
480	1.17E-02	585	6.13E-02	690	1.34E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4355, 0.4034)

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

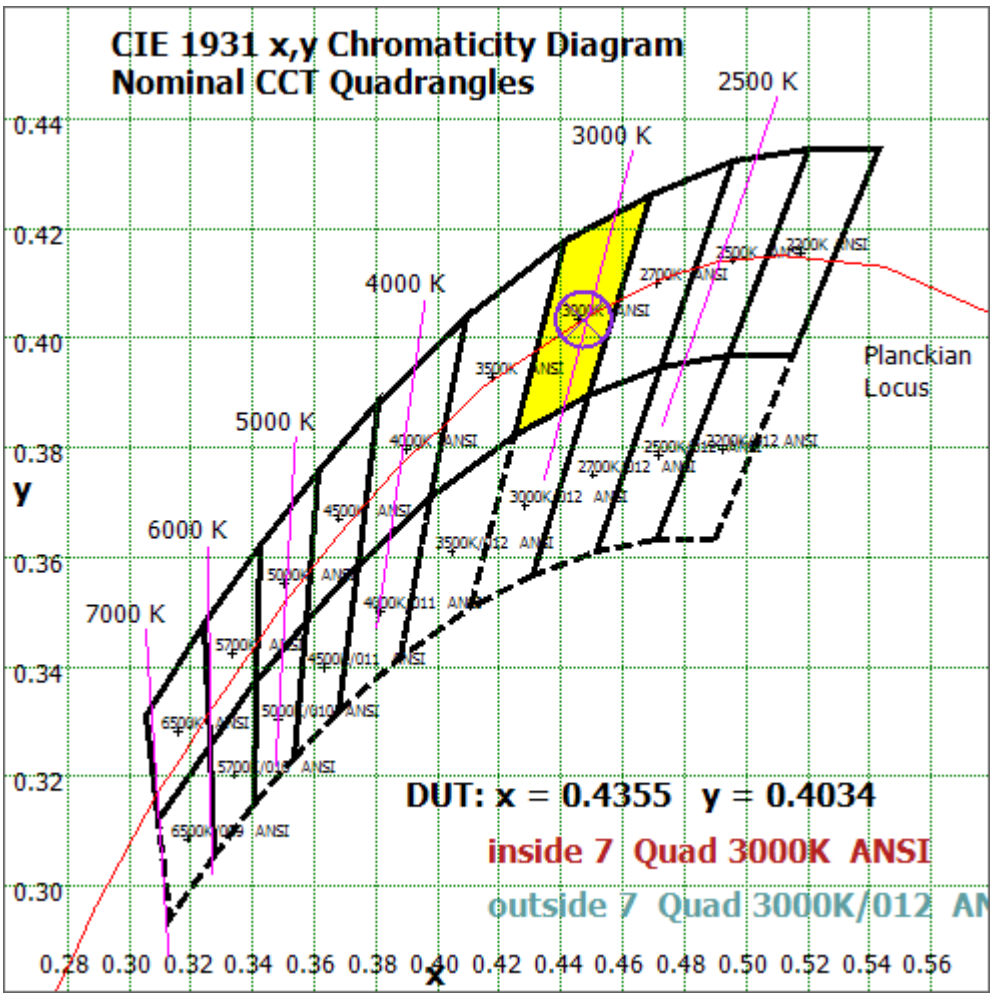


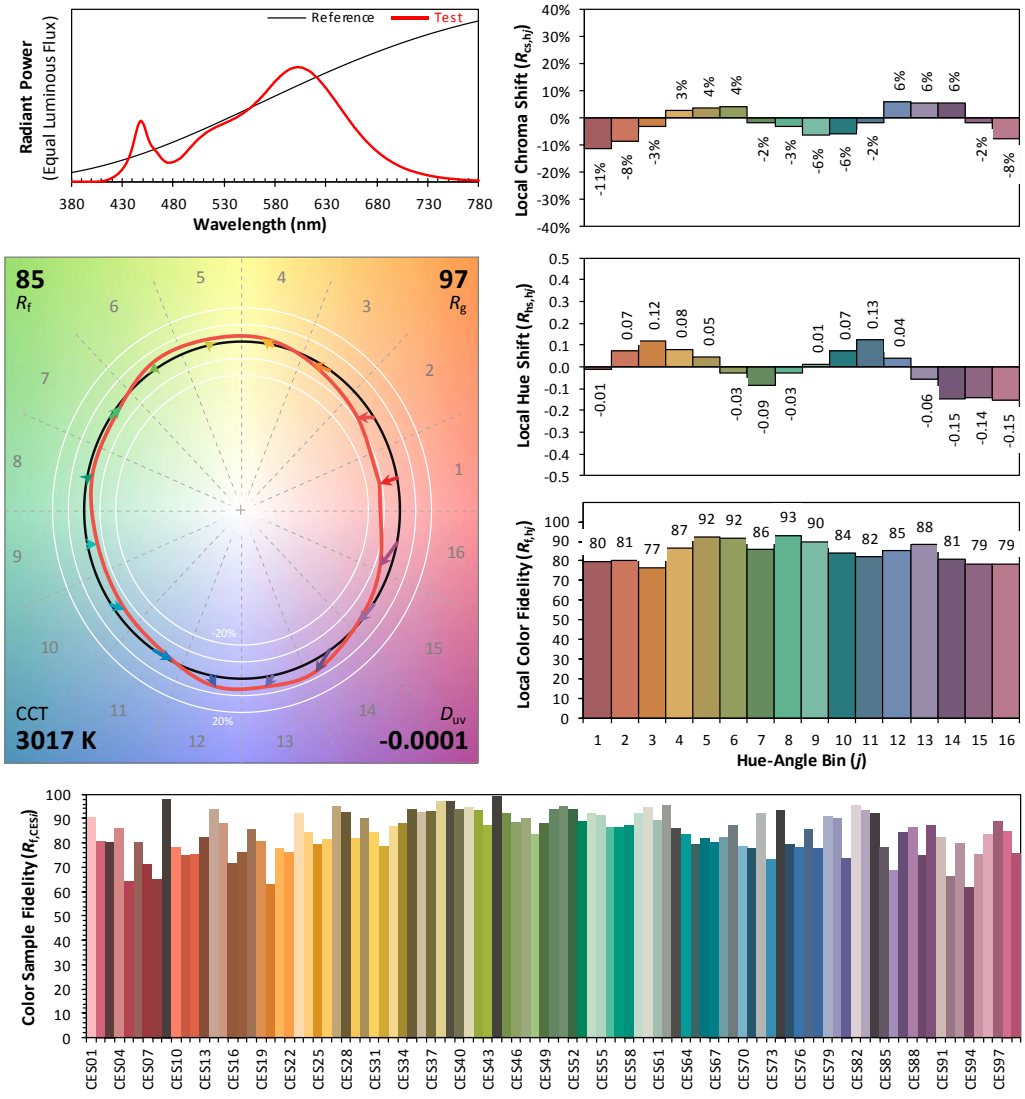
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** GREEN CREATIVE LTD

Date: 2021/12/07 **Model:** 24HID/830/277V/EX39/SD



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

x	0.4355
y	0.4034
u'	0.2500
v'	0.5209

CIE 13.3-1995 (CRI)

R_a	82
R_9	5

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

Chart 4: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 2 due to rounding.

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	37.941	1.14%
10- 20	112.708	3.38%
20- 30	183.977	5.52%
30- 40	248.37	7.45%
40- 50	300.909	9.03%
50- 60	336.902	10.11%
60- 70	353.5	10.61%
70- 80	350.138	10.51%
80- 90	328.393	9.86%
90-100	291.821	8.76%
100-110	245.408	7.37%
110-120	194.694	5.84%
120-130	144.621	4.34%
130-140	98.937	2.97%
140-150	60.278	1.81%
150-160	30.572	0.92%
160-170	11.157	0.33%
170-180	1.662	0.05%
Total	3332.0	100%

γ(°)	Lumens	% Total
0- 60	1220.81	36.64%
60- 90	1032.03	30.97%
0-90	2252.84	67.61%
90- 180	1079.15	32.39%
0- 180	3332.0	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

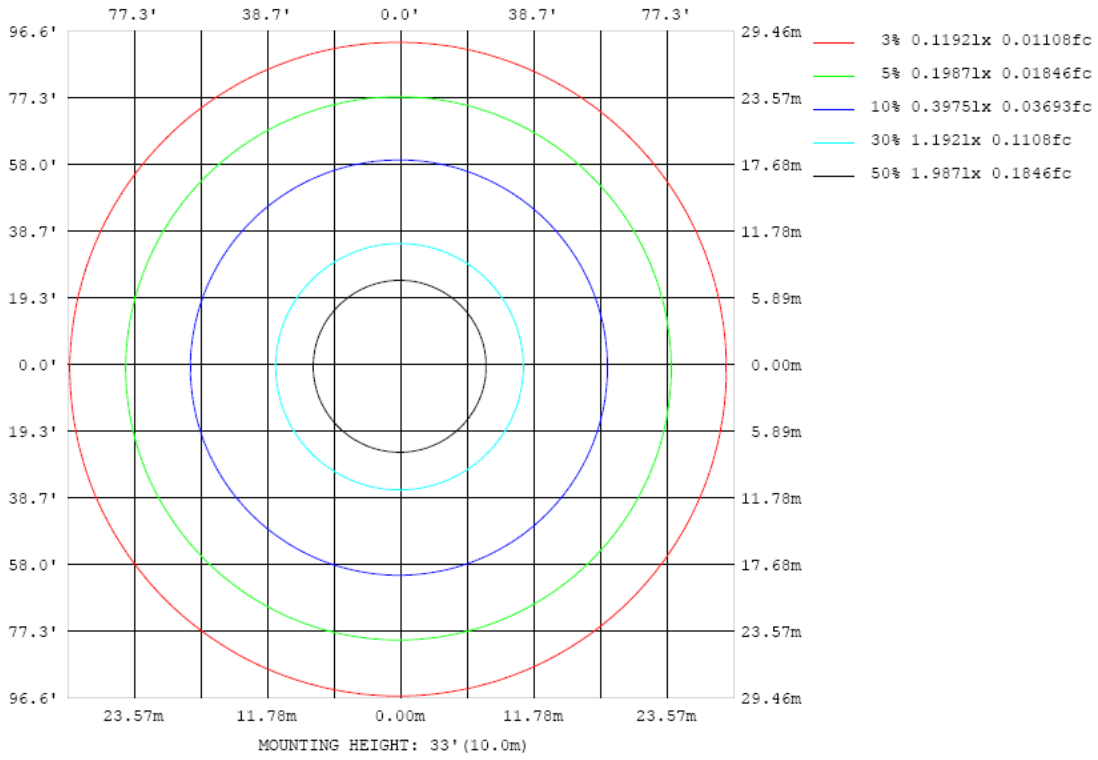


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

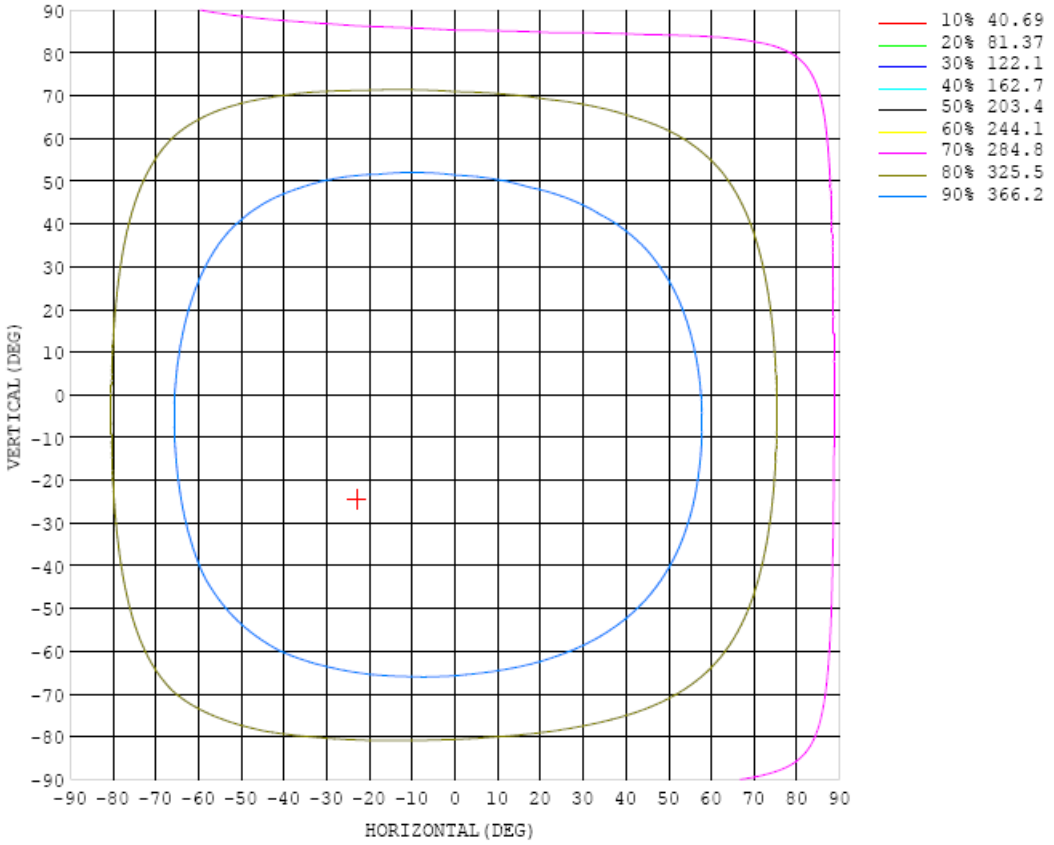


Chart 6: Isocandela Plot

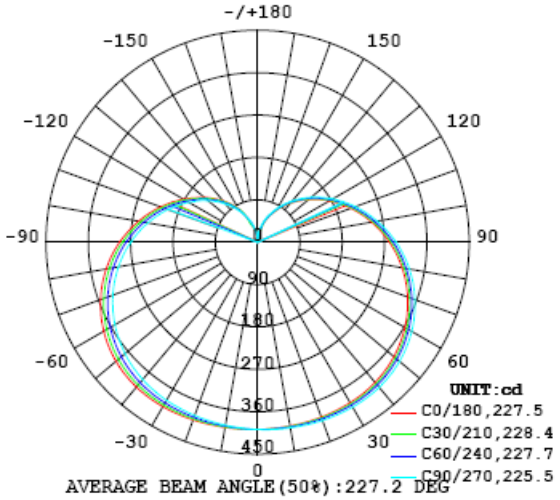


Chart 7: Polar Candela Distribution

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	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397
5	397	397	397	398	398	398	398	398	399	399	399	399	399	399	399	399	399	399	398
10	396	397	397	398	398	399	399	399	400	400	400	401	401	401	401	400	400	400	399
15	396	396	397	398	398	399	400	401	401	402	402	402	402	402	402	402	402	401	400
20	395	396	397	398	399	400	401	401	402	403	403	404	404	404	404	404	403	402	401
25	395	396	397	398	399	400	401	402	403	404	404	405	405	406	406	405	405	404	402
30	393	395	396	398	399	400	401	402	403	404	405	406	406	407	407	406	406	404	403
35	392	393	395	396	398	399	400	402	403	404	405	406	406	407	407	407	406	405	403
40	389	391	392	394	395	397	398	400	401	402	403	404	405	405	406	405	405	403	401
45	384	386	388	390	391	393	394	396	397	399	400	401	402	403	403	403	402	400	398
50	378	380	382	384	386	387	389	391	392	394	395	396	397	398	398	398	397	395	393
55	371	373	375	377	379	380	382	384	385	387	388	390	391	391	392	391	391	389	387
60	362	364	366	368	370	372	373	375	377	378	380	381	382	383	383	383	382	380	378
65	351	353	356	358	359	361	363	365	366	368	369	371	372	372	373	373	372	370	368
70	339	342	344	346	348	349	351	353	354	356	357	358	360	360	361	360	360	358	356
75	326	328	330	332	334	336	338	339	341	342	344	345	346	347	347	347	346	344	342
80	312	314	316	318	320	322	323	325	326	327	329	330	331	332	332	332	331	329	327
85	297	299	301	302	304	306	307	309	310	311	313	314	315	315	316	315	315	313	311
90	281	282	284	286	288	289	291	292	293	294	296	297	297	298	298	298	297	296	294
95	264	265	267	269	270	272	273	275	276	277	278	279	279	280	280	280	279	278	276
100	246	248	250	251	253	254	255	257	258	258	259	260	261	261	261	261	260	259	257
105	229	230	232	233	234	236	237	238	239	240	241	241	242	242	242	242	241	240	239
110	211	213	214	215	216	218	219	220	220	221	222	222	223	223	223	223	222	221	220
115	193	195	196	197	198	199	200	201	202	203	203	204	204	204	204	204	203	202	201
120	176	177	178	179	180	181	182	183	184	184	185	185	185	186	186	185	185	184	183
125	158	159	160	162	163	164	164	165	166	166	167	167	167	167	167	167	166	166	165
130	141	142	143	144	145	146	147	147	148	148	149	149	149	149	149	149	149	149	148
135	125	126	126	127	128	129	130	130	131	131	132	132	132	132	132	132	132	131	131
140	109	109	110	111	112	112	113	114	114	115	115	115	115	115	115	115	115	115	115
145	92.8	93.5	94.2	94.9	95.6	96.3	97.0	97.7	98.2	98.7	99.0	99.1	99.2	99.3	99.2	99.1	99.0	98.9	98.8
150	77.7	78.3	78.9	79.5	80.2	80.9	81.6	82.2	82.7	83.1	83.4	83.7	83.9	83.9	83.9	83.8	83.5	83.1	82.6
155	64.0	64.4	64.9	65.4	65.9	66.5	67.2	67.7	67.8	67.9	68.4	68.9	69.2	69.3	69.5	69.6	68.6	65.7	63.1
160	50.5	50.8	51.3	51.9	52.6	53.2	53.8	54.4	54.9	55.3	55.7	56.0	56.2	56.3	56.7	56.8	55.2	50.8	46.0
165	37.5	32.4	30.3	32.0	35.7	38.8	40.7	41.8	42.3	42.6	43.0	43.3	43.2	42.8	43.2	43.8	42.7	38.5	34.1
170	24.3	20.1	18.1	18.7	21.1	24.1	27.1	29.4	30.4	31.0	31.5	31.6	31.2	30.7	30.9	31.7	31.1	27.9	24.6
175	11.0	9.99	9.79	10.6	11.9	13.3	14.4	15.7	17.2	18.5	19.2	19.6	19.6	19.2	19.1	19.1	18.0	15.0	12.3
180	0.53	0.88	1.22	1.68	2.01	1.64	0.69	0.00	0.00	0.00	0.06	0.45	2.07	3.81	3.61	1.54	0.00	0.04	0.53

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	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397	397		
5	398	398	397	397	397	396	396	396	396	396	396	396	396	396	396	396	397		
10	399	398	397	397	396	396	395	395	394	394	394	394	394	394	395	395	396		
15	400	399	398	397	396	395	394	393	393	393	393	393	393	393	394	394	395		
20	400	399	398	396	395	394	393	392	391	391	391	391	391	392	392	393	394		
25	401	399	398	396	394	393	392	391	390	389	389	389	390	390	391	392	393		
30	401	400	397	395	393	391	390	388	387	387	387	387	387	388	389	391	392		
35	401	399	396	393	391	389	387	386	385	384	384	384	385	386	387	388	390		
40	399	396	393	390	388	385	383	382	380	380	380	380	381	382	383	385	387		
45	396	393	389	386	383	380	378	376	375	374	374	374	375	377	378	380	382		
50	391	387	384	380	377	374	371	369	368	367	367	368	369	370	372	374	376		
55	384	380	377	373	369	366	363	361	360	359	359	360	361	362	364	366	368		
60	375	372	368	364	360	357	354	352	351	350	350	350	351	353	355	357	359		
65	365	361	357	353	350	346	343	341	340	339	339	339	341	342	344	347	349		
70	352	349	345	341	338	334	331	329	328	327	327	328	329	330	333	335	337		
75	339	336	332	328	324	321	318	316	315	314	314	315	316	317	320	322	324		
80	324	321	317	314	310	307	304	302	301	300	300	300	302	303	305	308	310		
85	308	305	301	298	295	292	289	287	286	285	285	286	287	289	291	293	295		
90	291	288	285	282	279	276	273	271	270	270	270	270	271	273	275	277	279		
95	273	271	268	264	262	259	257	255	254	253	253	254	255	257	258	260	262		
100	255	253	250	247	244	242	240	238	237	237	237	237	238	240	241	243	245		
105	236	234	232	229	227	224	223	221	220	220	220	220	221	223	224	226	227		
110	218	216	214	211	209	207	205	204	203	203	203	204	204	206	207	209	210		
115	199	198	196	193	191	190	188	187	186	186	186	187	187	188	190	191	192		
120	181	180	178	176	174	173	171	170	169	169	169	170	170	171	173	174	175		
125	163	162	160	159	157	156	155	154	154	153	153	154	154	155	156	157	158		
130	147	146	144	143	141	140	139	138	138	137	137	138	138	139	140	141	141		
135	130	129	128	126	125	124	123	122	122	121	121	122	122	123	124	125	125		
140	114	113	111	110	109	108	107	106	106	106	106	106	106	107	108	109	109		
145	98.1	97.1	96.0	94.8	93.6	92.6	91.7	91.1	90.6	90.4	90.3	90.5	91.0	91.6	92.4	92.9	93.0		
150	82.4	82.0	80.8	79.4	78.3	77.6	77.1	76.5	76.0	75.6	75.5	75.7	76.0	76.7	77.4	77.9	78.0		
155	63.3	64.0	63.7	62.8	62.6	63.1	63.3	62.7	62.1	61.7	61.5	61.6	61.9	62.4	63.0	63.5	63.8		
160	41.9	39.6	41.8	46.1	49.0	49.6	49.6	49.4	49.1	48.8	48.6	48.6	48.7	49.1	49.5	49.9	50.3		
165	31.9	31.1	32.0	33.9	35.4	36.1	36.6	36.9	37.1	36.9	36.6	36.6	36.6	36.8	37.1	37.4	37.5		
170	23.4	23.1	23.0	23.3	23.9	24.7	25.3	25.1	24.8	24.8	24.9	25.0	25.1	25.3	25.4	25.3	25.0		
175	12.0	12.4	12.3	11.8	11.4	11.1	11.0	11.0	11.2	11.2	11.2	11.2	11.2	11.4	11.5	11.6	11.4		
180	0.57	0.54	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 05, 2021	Aug. 04, 2022
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2021	Aug. 04, 2022
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2021	Aug. 04, 2022
Standard source	D908	HZTE012-01	Aug. 05, 2021	Aug. 04, 2022
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2021	Aug. 04, 2022
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2021	Aug. 04, 2022
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2021	Aug. 04, 2022
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2021	Aug. 04, 2022

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.

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86 571 86376106 www.ledtestlab.com

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

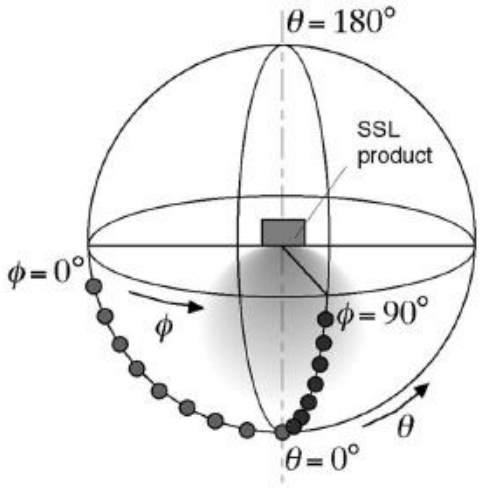
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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.



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