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/850/277V/EX39/SD

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ21120007ab

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

Review by: April Zou

Engineer: April Zou

Dec. 16, 2021

Approved by: Jim Zhang

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/850/277V/EX39/SD**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
142.4	3351.8	23.53	0.9877

CCT (K)	CRI	Stabilization Time (Light & Power)
4786	82.5	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/850/277V/EX39/SD
Electrical Ratings	: 120-277V, 50/60Hz, 24W
Product Description	: 5000K
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)	0.199	0.093
Power Factor	0.9877	0.9178
Test Power (W)	23.53	23.66
THD A%	8.03	11.57
Luminous Efficacy (lm/W)	142.4	141.5
Total Luminous Flux (lm)	3351.8	3347.7
Color Rendering Index (CRI)	82.5	
R9	7	
Correlated Color Temperature (CCT)(K)	4786	
Chromaticity Chroma x	0.3523	
Chromaticity Chroma y	0.3647	
Chromaticity Chroma u	0.2113	
Chromaticity Chroma v	0.3280	
Duv	0.0036	
Chromaticity Chroma u ’	0.2113	
Chromaticity Chroma v’	0.4920	

Special Color Rendering Indices	
R1	80.2
R2	86.8
R3	92.4
R4	82.5
R5	80.7
R6	82.1
R7	87.8
R8	67.4
R9	7
R10	69.2
R11	81.6
R12	60
R13	81.6
R14	95.9

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)	0.201
Power Factor	0.9882
Power (W)	23.80
Luminous Efficacy (lm/W)	144.0
Total Luminous Flux (lm)	3426.1
Beam Angle (°)	225.1 (0^o-180^o) / 227.8 (90^o-270^o)
Center Beam Candle Power (cd)	408
Maximum Beam Candle Power (cd)	422.2 (At: C=170.0, Gamma=32.0)
Spacing Criteria	1.57 (0^o-180^o) / 1.51 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	36.59%
Zonal Lumens in the 60 °-90 °Zone	30.93%
Zonal Lumens in the 90 °-120 °Zone	21.97%
Zonal Lumens in the 120 °-180 °Zone	10.50%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

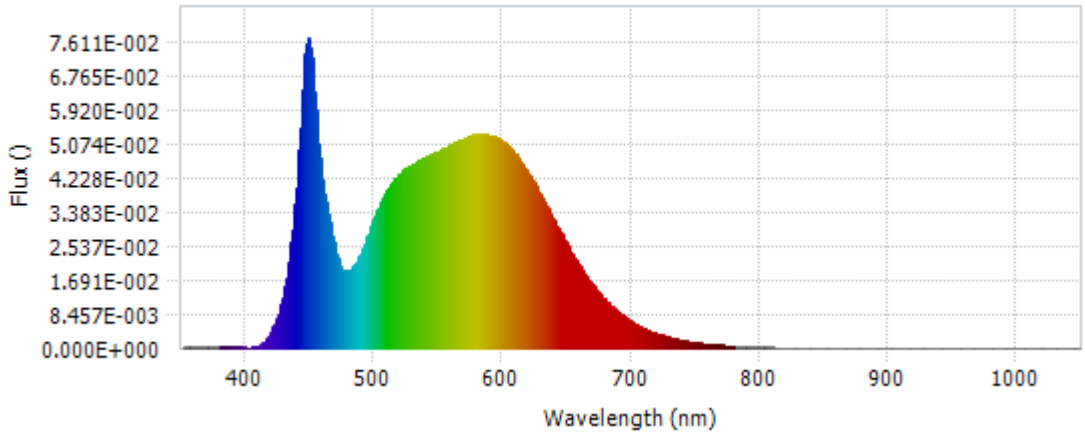
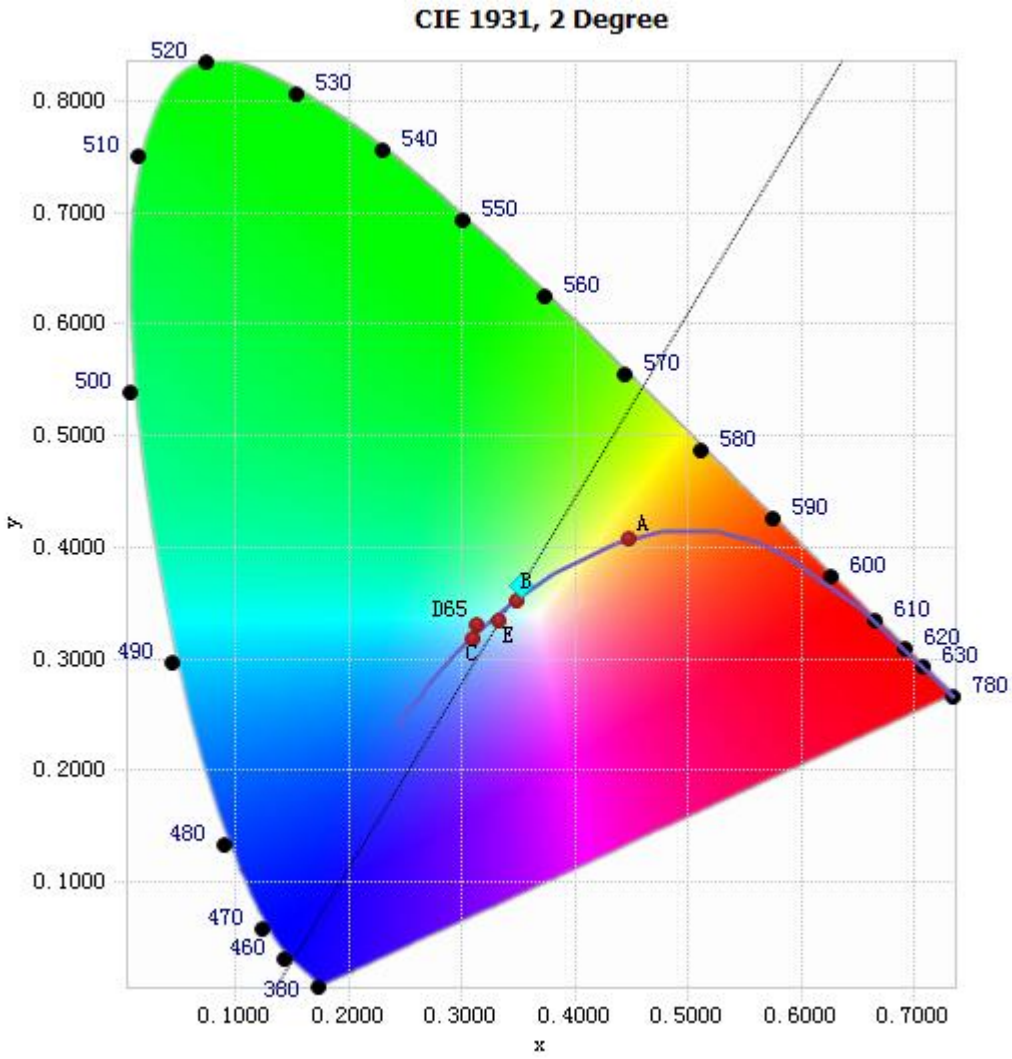


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.62E-04	485	2.10E-02	590	5.29E-02	695	7.75E-03
385	3.04E-04	490	2.42E-02	595	5.22E-02	700	6.63E-03
390	2.79E-04	495	2.85E-02	600	5.13E-02	705	5.71E-03
395	2.38E-04	500	3.28E-02	605	4.99E-02	710	4.90E-03
400	1.89E-04	505	3.65E-02	610	4.80E-02	715	4.19E-03
405	3.09E-04	510	3.94E-02	615	4.59E-02	720	3.65E-03
410	6.95E-04	515	4.19E-02	620	4.34E-02	725	3.12E-03
415	2.02E-03	520	4.34E-02	625	4.06E-02	730	2.67E-03
420	4.47E-03	525	4.48E-02	630	3.77E-02	735	2.28E-03
425	8.69E-03	530	4.58E-02	635	3.47E-02	740	1.94E-03
430	1.56E-02	535	4.66E-02	640	3.17E-02	745	1.67E-03
435	2.64E-02	540	4.75E-02	645	2.87E-02	750	1.43E-03
440	4.44E-02	545	4.84E-02	650	2.57E-02	755	1.22E-03
445	6.94E-02	550	4.90E-02	655	2.29E-02	760	1.06E-03
450	7.48E-02	555	4.98E-02	660	2.03E-02	765	9.13E-04
455	5.47E-02	560	5.05E-02	665	1.79E-02	770	7.86E-04
460	4.00E-02	565	5.12E-02	670	1.57E-02	775	6.65E-04
465	3.14E-02	570	5.21E-02	675	1.37E-02	780	5.80E-04
470	2.34E-02	575	5.26E-02	680	1.20E-02		
475	1.96E-02	580	5.30E-02	685	1.04E-02		
480	1.94E-02	585	5.32E-02	690	8.96E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3523, 0.3647)

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

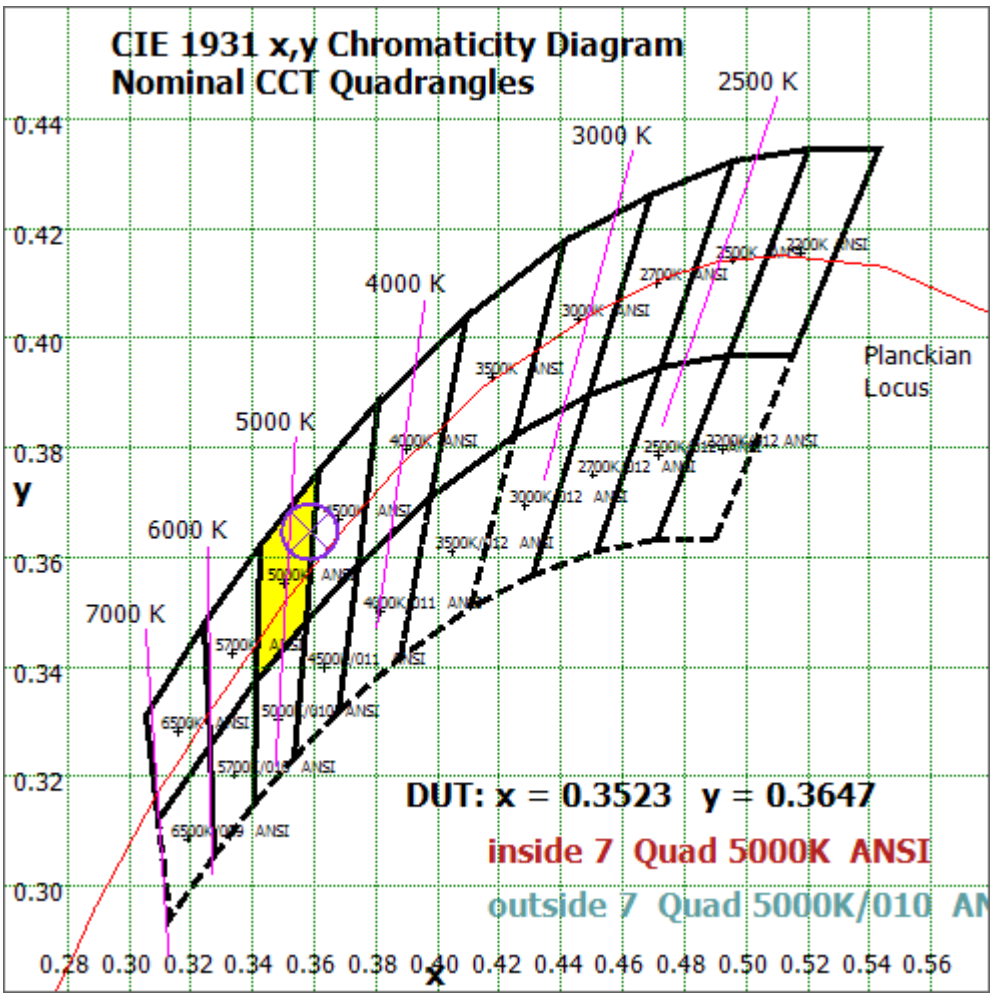


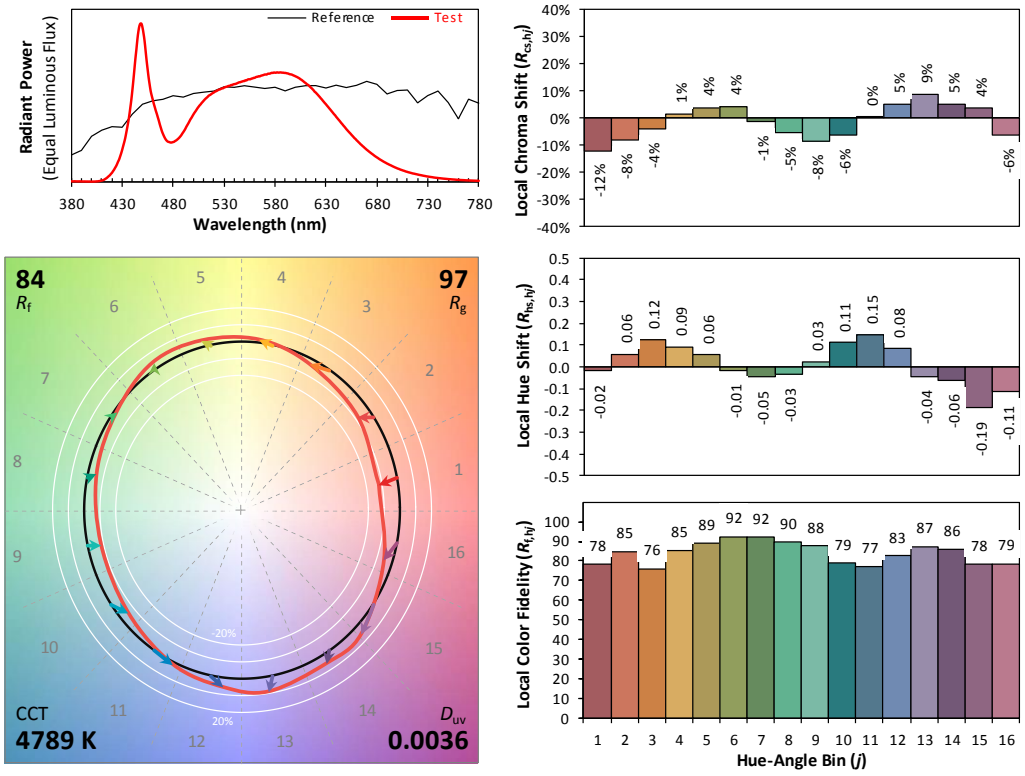
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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/850/277V/EX39/SD



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

x	0.3523
y	0.3647
u'	0.2113
v'	0.4920

CIE 13.3-1995 (CRI)

R_a	83
R_9	7

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	38.98	1.14%
10- 20	115.797	3.38%
20- 30	188.981	5.52%
30- 40	255.068	7.44%
40- 50	308.999	9.02%
50- 60	345.939	10.10%
60- 70	362.964	10.59%
70- 80	359.521	10.49%
80- 90	337.228	9.84%
90-100	299.807	8.75%
100-110	252.409	7.37%
110-120	200.632	5.86%
120-130	149.32	4.36%
130-140	102.488	2.99%
140-150	62.613	1.83%
150-160	31.841	0.93%
160-170	11.714	0.34%
170-180	1.754	0.05%
Total	3426.1	100%

γ(°)	Lumens	% Total
0- 60	1253.76	36.59%
60- 90	1059.71	30.93%
0-90	2313.48	67.53%
90- 180	1112.58	32.47%
0- 180	3426.1	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

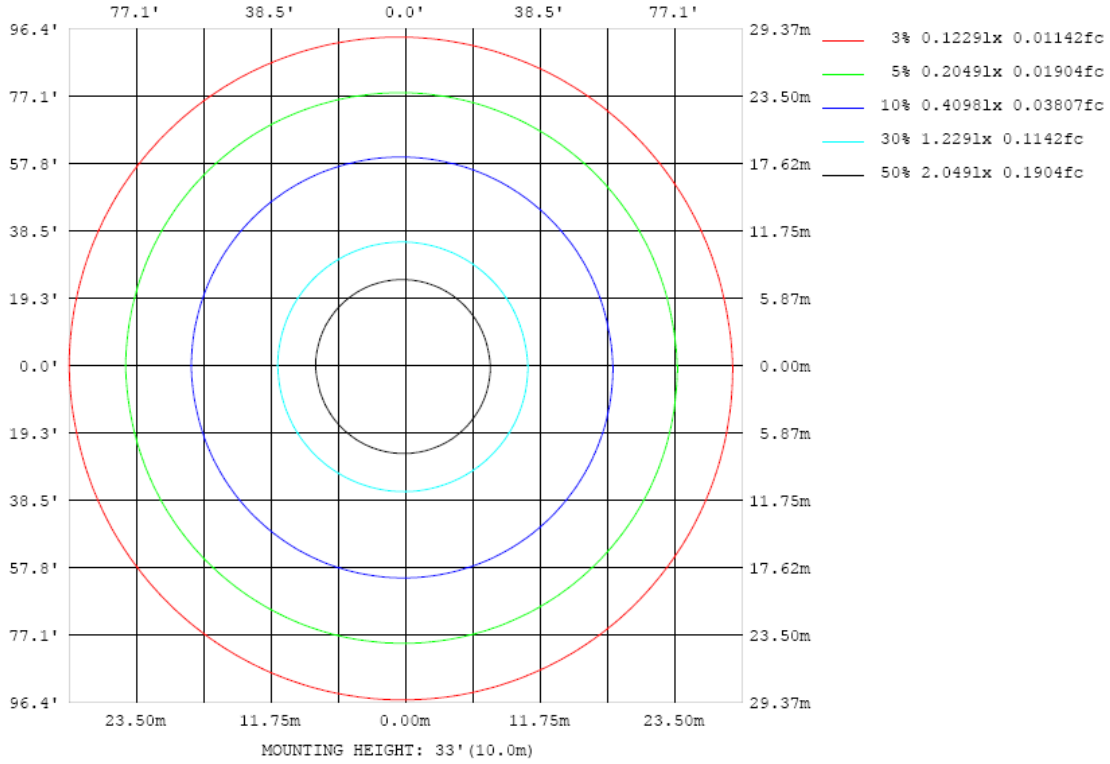


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

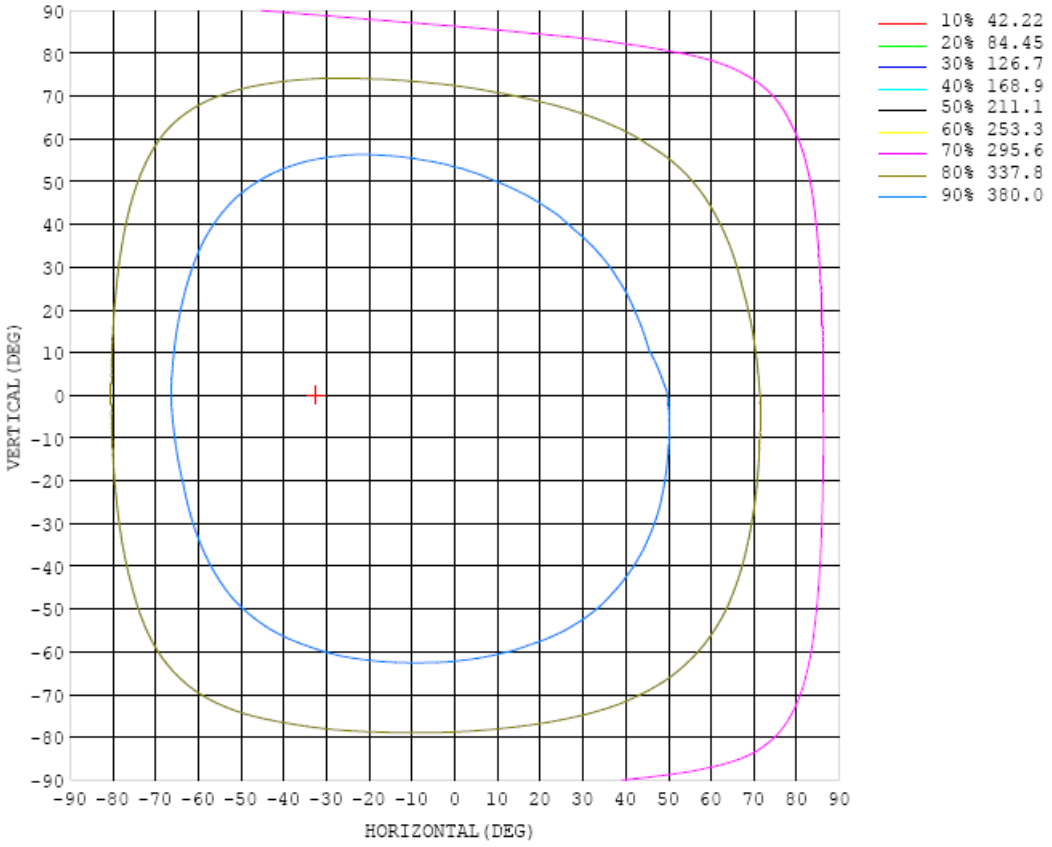


Chart 6: Isocandela Plot

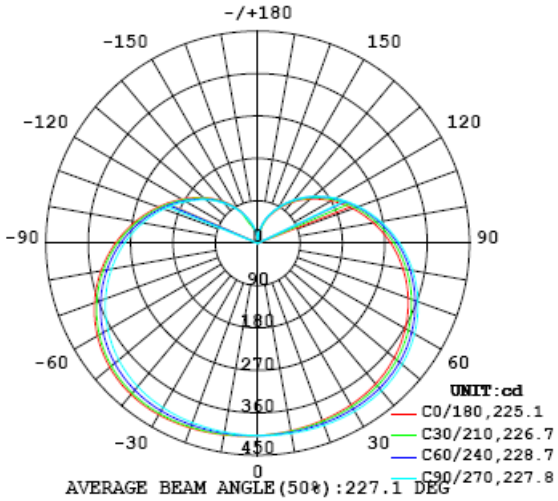


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) / γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	408	408	408	408	408	408	408	408	408	408	408	408	408	408	408	408	408	408	408
5	406	406	407	407	407	408	408	408	409	409	410	410	410	410	410	410	411	411	411
10	404	404	405	405	406	407	407	408	409	410	411	411	412	412	412	413	413	413	413
15	402	403	403	404	406	406	407	408	410	411	412	413	413	414	415	415	415	415	415
20	400	401	402	403	404	406	407	408	410	411	413	414	415	416	416	417	418	417	418
25	398	399	400	402	404	405	407	408	410	412	413	415	416	417	418	419	419	419	419
30	396	397	399	400	402	404	406	408	410	412	414	415	416	418	419	420	420	420	420
35	393	395	396	398	400	403	405	407	409	411	413	415	416	418	419	420	420	420	420
40	390	391	393	395	398	400	402	404	407	409	411	413	414	416	417	418	419	419	419
45	385	386	388	391	394	396	399	401	403	405	407	409	411	413	414	415	416	416	416
50	378	380	383	385	388	391	393	396	398	400	402	404	406	407	409	410	410	410	410
55	371	373	375	378	381	384	386	389	391	393	395	397	399	400	401	402	403	403	403
60	362	364	367	369	372	375	378	380	382	384	386	388	390	391	392	393	393	394	393
65	352	354	356	359	362	365	368	370	372	374	376	377	379	380	381	382	382	382	382
70	340	343	345	348	351	354	356	358	360	362	364	365	367	367	368	369	369	369	369
75	327	330	332	335	338	341	343	345	347	349	350	352	353	353	354	355	355	355	354
80	313	316	318	321	324	326	329	331	333	334	335	336	337	338	338	339	339	338	338
85	298	301	303	306	309	311	313	315	317	318	319	320	321	321	321	322	321	321	321
90	283	285	288	290	293	295	297	299	300	301	302	303	303	303	303	303	303	303	303
95	266	269	271	273	276	278	280	281	283	284	284	285	285	285	285	285	284	284	284
100	250	252	254	256	258	261	262	263	265	265	266	266	266	266	266	265	265	264	264
105	232	234	236	238	241	243	244	245	246	247	247	247	247	247	246	246	245	245	244
110	215	217	219	221	223	225	226	227	228	228	228	228	228	228	227	227	226	226	225
115	198	199	201	203	205	206	207	208	209	210	210	210	209	209	208	208	207	206	206
120	180	182	184	185	187	188	189	190	191	191	191	191	191	190	189	189	188	187	187
125	163	165	166	168	169	170	171	172	173	173	173	173	172	172	171	170	169	169	168
130	146	147	149	150	152	153	154	154	155	155	155	155	154	153	153	152	151	151	151
135	129	131	132	133	135	136	136	137	137	137	137	137	137	136	135	135	134	133	134
140	113	114	116	117	118	119	119	120	120	120	120	120	119	119	118	118	117	116	117
145	97.4	98.4	99.6	101	102	102	103	103	103	104	104	103	103	102	102	101	100	99.7	100
150	82.0	83.0	84.2	85.1	86.0	86.5	86.9	87.3	87.5	87.5	87.4	87.2	86.8	86.3	85.8	85.2	84.5	84.0	83.1
155	67.6	68.4	69.3	70.2	70.9	71.4	71.7	71.9	72.2	72.1	72.1	71.9	71.4	71.1	70.7	70.0	69.6	69.1	62.9
160	54.5	55.4	56.2	57.0	57.5	57.9	58.2	58.2	58.5	58.4	58.4	58.3	57.9	57.6	57.2	56.7	56.2	55.7	46.0
165	41.3	32.5	34.6	39.3	41.8	40.8	44.8	44.9	45.0	45.0	45.0	44.9	44.6	43.6	43.0	43.6	43.1	41.9	33.3
170	28.0	22.7	19.3	22.6	20.5	27.5	29.0	31.3	32.3	32.8	32.8	32.8	32.2	31.2	30.7	31.5	31.1	28.7	23.5
175	15.3	15.6	14.8	9.94	12.7	13.6	15.1	16.2	17.5	19.7	20.5	20.6	19.7	19.1	18.2	17.9	17.3	17.7	10.6
180	1.57	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.00	0.00	0.00	0.00	0.55

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	408	408	408	408	408	408	408	408	408	408	408	408	408	408	408	408	408		
5	410	410	410	410	409	409	408	408	407	407	407	407	406	406	406	406	406		
10	412	412	412	411	410	409	408	408	407	406	405	405	404	404	404	404	404		
15	415	414	413	413	411	410	409	407	406	405	404	403	402	402	402	402	402		
20	417	416	415	414	412	411	409	407	405	404	402	401	400	400	399	399	400		
25	419	418	417	415	413	411	409	406	404	402	401	399	398	397	397	397	398		
30	420	419	417	416	413	411	408	406	403	401	399	397	396	395	395	395	395		
35	420	418	417	415	413	409	407	403	401	398	396	394	392	392	391	391	392		
40	418	417	415	413	410	407	404	400	397	394	392	390	388	387	387	387	388		
45	415	413	411	409	406	403	399	395	392	389	386	384	382	382	382	382	383		
50	410	408	406	404	400	397	393	389	386	382	379	377	376	375	375	376	376		
55	402	400	398	396	393	389	385	381	377	374	371	369	368	367	367	368	369		
60	392	391	389	386	383	379	375	371	368	364	362	359	358	357	358	358	360		
65	381	379	377	375	372	368	364	360	357	353	351	348	347	347	347	348	349		
70	368	366	364	362	359	355	351	348	344	341	338	337	335	335	335	336	338		
75	353	352	350	347	344	341	337	334	331	328	325	323	322	322	322	323	325		
80	337	335	333	331	329	325	322	319	316	313	311	309	308	308	308	310	311		
85	320	318	316	314	312	309	306	303	300	297	295	294	293	293	294	295	296		
90	301	300	298	296	294	291	289	286	283	281	279	278	277	277	278	279	281		
95	282	281	279	278	276	273	271	268	266	264	262	261	261	261	262	263	265		
100	263	262	260	259	257	255	252	250	248	247	245	244	244	244	245	246	248		
105	243	242	241	239	238	236	234	232	230	229	228	227	227	227	228	229	231		
110	224	223	221	220	219	217	215	214	213	211	210	210	210	210	211	212	214		
115	205	203	202	201	200	199	197	196	195	194	193	192	192	193	194	195	196		
120	186	185	184	183	181	180	179	178	177	176	175	175	175	176	177	178	179		
125	167	166	165	164	163	162	161	160	160	159	159	158	158	159	160	161	162		
130	150	149	148	148	147	146	145	144	144	143	143	143	143	143	144	145	146		
135	133	132	131	130	129	129	128	127	127	126	126	126	126	127	128	129	130		
140	116	115	114	113	113	112	112	111	110	110	110	110	110	111	111	112	113		
145	99.2	98.4	98.0	97.2	96.7	96.3	95.8	95.2	94.7	94.5	94.2	94.3	94.6	94.9	95.7	96.6	97.5		
150	83.3	82.6	82.1	80.3	81.1	80.8	80.4	79.9	79.5	79.2	79.1	79.1	79.3	79.8	80.4	81.2	82.2		
155	64.1	65.9	53.7	62.7	64.8	66.2	65.9	65.5	65.1	64.8	64.7	64.8	64.9	65.4	66.0	66.6	67.6		
160	40.2	39.1	40.3	47.9	49.3	50.7	52.0	52.0	51.7	51.4	51.3	51.4	51.6	51.9	52.4	53.1	53.8		
165	32.0	30.2	30.6	33.3	36.4	37.2	38.0	38.8	39.3	39.2	39.1	39.1	39.4	39.7	40.1	40.6	41.2		
170	23.4	22.2	21.8	22.3	23.4	25.2	25.8	26.2	26.6	27.4	27.5	27.6	27.9	28.3	28.7	28.7	28.8		
175	10.9	11.3	10.9	10.2	9.97	9.56	10.0	10.2	12.2	12.8	12.8	13.8	13.6	14.3	14.6	14.0	14.8		
180	0.55	0.55	0.54	0.55	0.55	0.55	0.54	0.55	0.54	0.54	0.55	0.55	0.55	0.55	0.55	0.55	0.55		

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.

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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

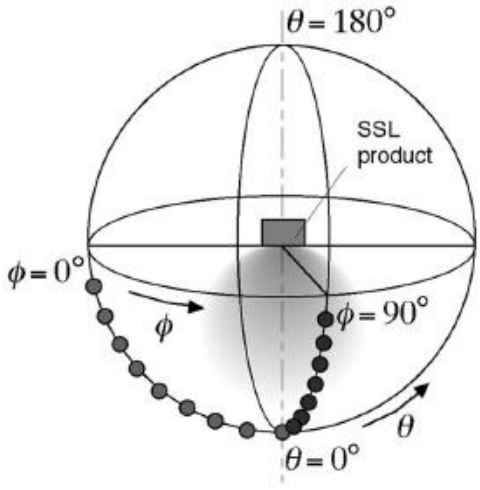
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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