

## 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/840/277V/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](http://www.ledtestlab.com)

Report No.: HZ21120007aa

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/840/277V/EX39/SD

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
147.5	3473.2	23.54	0.9876
CCT (K)	CRI	Stabilization Time (Light & Power)	
3890	82.3	60	

Table 1: Executive Data Summary

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

### Test specifications:

<b>Date of Receipt</b>	: Dec. 03, 2021
<b>Date of Test</b>	: Dec. 07, 2021
<b>Test item</b>	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
<b>Reference Standard</b>	: 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

LM-79-08 TEST REPORT .....	1
TEST SUMMARY .....	2
SAMPLE PHOTO .....	4
TEST RESULTS .....	5
Sphere-Spectroradiometer Method.....	5
Goniophotometer Method .....	6
Spectral Power Distribution - Sphere Spectroradiometer Method .....	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method .....	9
Color Rendition Report – Sphere Spectroradiometer Method .....	10
Zonal Lumen Tabulation- Goniophotometer Method .....	11
Illuminance Plots- Goniophotometer Method .....	12
Luminous Intensity Distribution Plots- Goniophotometer Method.....	13
Luminous Intensity Data- Goniophotometer Method .....	14
EQUIPMENT LIST .....	16
TEST METHODS .....	16
Seasoning of SSL Product.....	16
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	16
Goniophotometer Method .....	17
Photometric and Electrical Measurements .....	17
Color Characteristics Measurements.....	17
Color Spatial Uniformity .....	17

## SAMPLE PHOTO



Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Lamp
<b>Model</b>	: 24HID/840/277V/EX39/SD
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz, 24W
<b>Product Description</b>	: 4000K
<b>Manufacturer</b>	: GREEN CREATIVE LTD
<b>Address</b>	: 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 °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)	0.199	0.093
Power Factor	0.9876	0.9197
Test Power (W)	23.54	23.57
THD A%	8.06	15.67
Luminous Efficacy (lm/W)	147.5	146.7
Total Luminous Flux (lm)	3473.2	3458.3
Color Rendering Index (CRI)	82.3	
R9	4.3	
Correlated Color Temperature (CCT)(K)	3890	
Chromaticity Chroma x	0.3860	
Chromaticity Chroma y	0.3822	
Chromaticity Chroma u	0.2266	
Chromaticity Chroma v	0.3365	
Duv	0.0010	
Chromaticity Chroma u'	0.2266	
Chromaticity Chroma v'	0.5048	

Special Color Rendering Indices	
R1	80.2
R2	88.3
R3	94.9
R4	81.8
R5	80.7
R6	84.4
R7	85.5
R8	62.9
R9	4.3
R10	72.8
R11	81
R12	64.5
R13	82.1
R14	97.3

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 °C.

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)	23.77
Luminous Efficacy (lm/W)	149.2
Total Luminous Flux (lm)	3547.4
Beam Angle ( ° )	228.1 (0°-180°) / 231.3 (90°-270°)
Center Beam Candle Power (cd)	414
Maximum Beam Candle Power (cd)	431.0 (At: C=170.0, Gamma=35.5)
Spacing Criteria	1.59 (0°-180°) / 1.53 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	36.29%
Zonal Lumens in the 60 °-90 °Zone	31.07%
Zonal Lumens in the 90 °-120 °Zone	22.13%
Zonal Lumens in the 120 °-180 °Zone	10.51%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

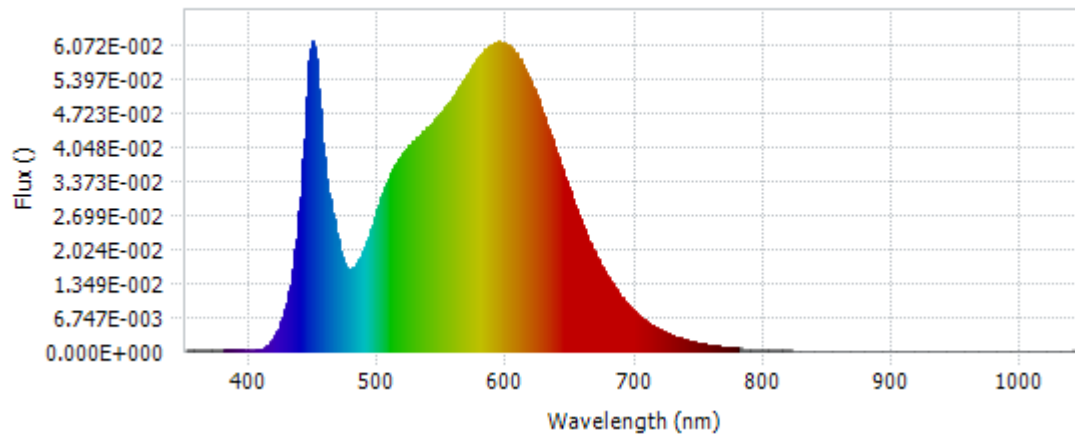
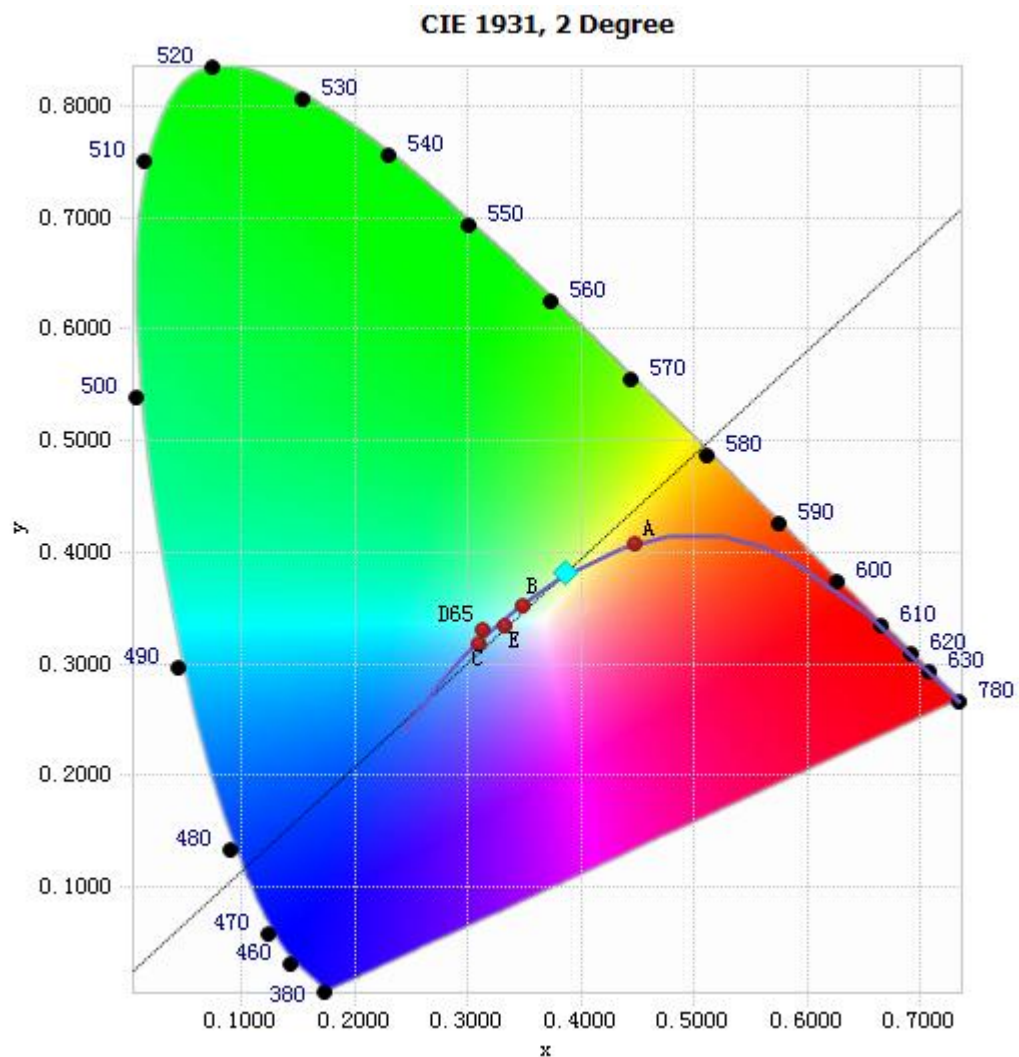


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.06E-04	485	1.81E-02	590	6.09E-02	695	9.00E-03
385	2.63E-04	490	2.10E-02	595	6.12E-02	700	7.75E-03
390	2.49E-04	495	2.49E-02	600	6.07E-02	705	6.59E-03
395	1.82E-04	500	2.90E-02	605	5.95E-02	710	5.66E-03
400	1.78E-04	505	3.25E-02	610	5.78E-02	715	4.86E-03
405	2.09E-04	510	3.54E-02	615	5.53E-02	720	4.19E-03
410	5.48E-04	515	3.79E-02	620	5.25E-02	725	3.58E-03
415	1.58E-03	520	3.96E-02	625	4.92E-02	730	3.05E-03
420	3.40E-03	525	4.10E-02	630	4.58E-02	735	2.61E-03
425	6.60E-03	530	4.23E-02	635	4.20E-02	740	2.20E-03
430	1.18E-02	535	4.36E-02	640	3.83E-02	745	1.89E-03
435	2.01E-02	540	4.49E-02	645	3.45E-02	750	1.60E-03
440	3.40E-02	545	4.63E-02	650	3.10E-02	755	1.38E-03
445	5.42E-02	550	4.77E-02	655	2.75E-02	760	1.19E-03
450	6.01E-02	555	4.94E-02	660	2.43E-02	765	1.01E-03
455	4.48E-02	560	5.11E-02	665	2.13E-02	770	8.68E-04
460	3.29E-02	565	5.32E-02	670	1.86E-02	775	7.43E-04
465	2.62E-02	570	5.52E-02	675	1.62E-02	780	6.31E-04
470	1.98E-02	575	5.72E-02	680	1.41E-02		
475	1.65E-02	580	5.88E-02	685	1.22E-02		
480	1.66E-02	585	6.03E-02	690	1.05E-02		

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

# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3860, 0.3822)

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

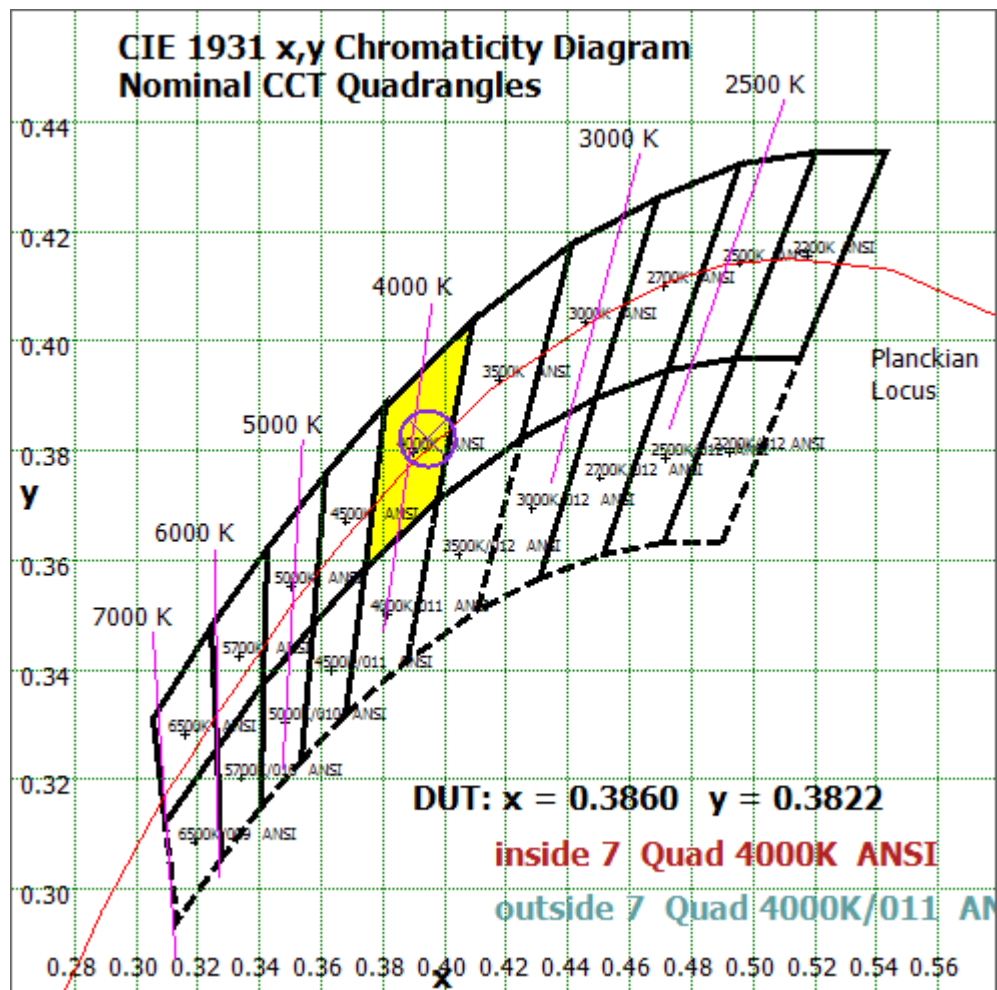


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

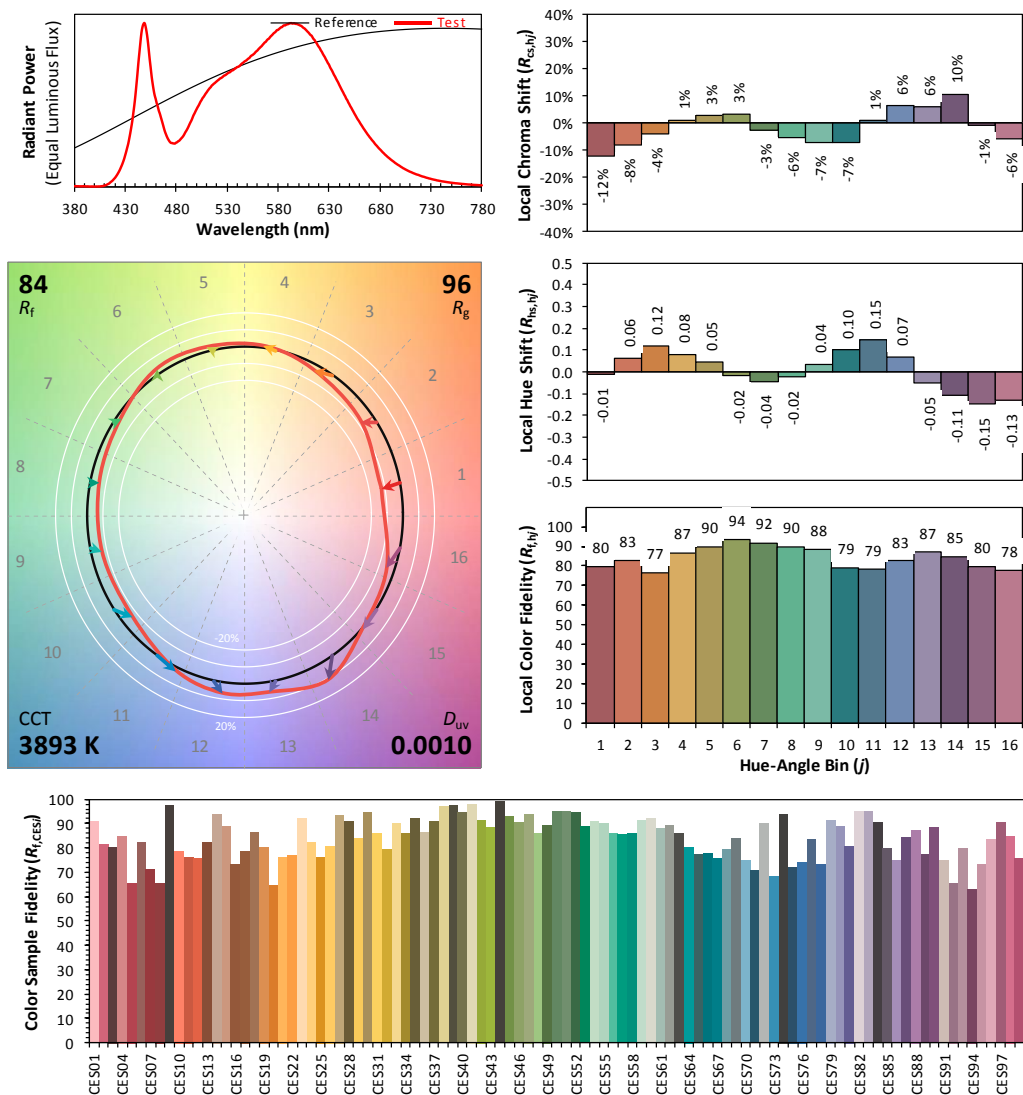
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2021/12/07

Model: 24HID/840/277V/EX39/SD



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

$x$  0.3860  
 $y$  0.3822  
 $u'$  0.2266  
 $v'$  0.5048

CIE 13.3-1995  
(CRI)  
 $R_a$  82  
 $R_9$  4

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

$\gamma(^{\circ})$	Lumens	% Total
0- 10	39.568	1.12%
10- 20	117.761	3.32%
20- 30	192.844	5.44%
30- 40	261.423	7.37%
40- 50	318.148	8.97%
50- 60	357.691	10.08%
60- 70	376.63	10.62%
70- 80	374.024	10.54%
80- 90	351.424	9.91%
90-100	312.677	8.81%
100-110	263.223	7.42%
110-120	209.02	5.89%
120-130	155.231	4.38%
130-140	106.365	3.00%
140-150	64.787	1.83%
150-160	32.788	0.92%
160-170	11.972	0.34%
170-180	1.778	0.05%
Total	3547.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1287.44	36.29%
60- 90	1102.08	31.07%
0-90	2389.51	67.36%
90- 180	1157.84	32.64%
0- 180	3547.4	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

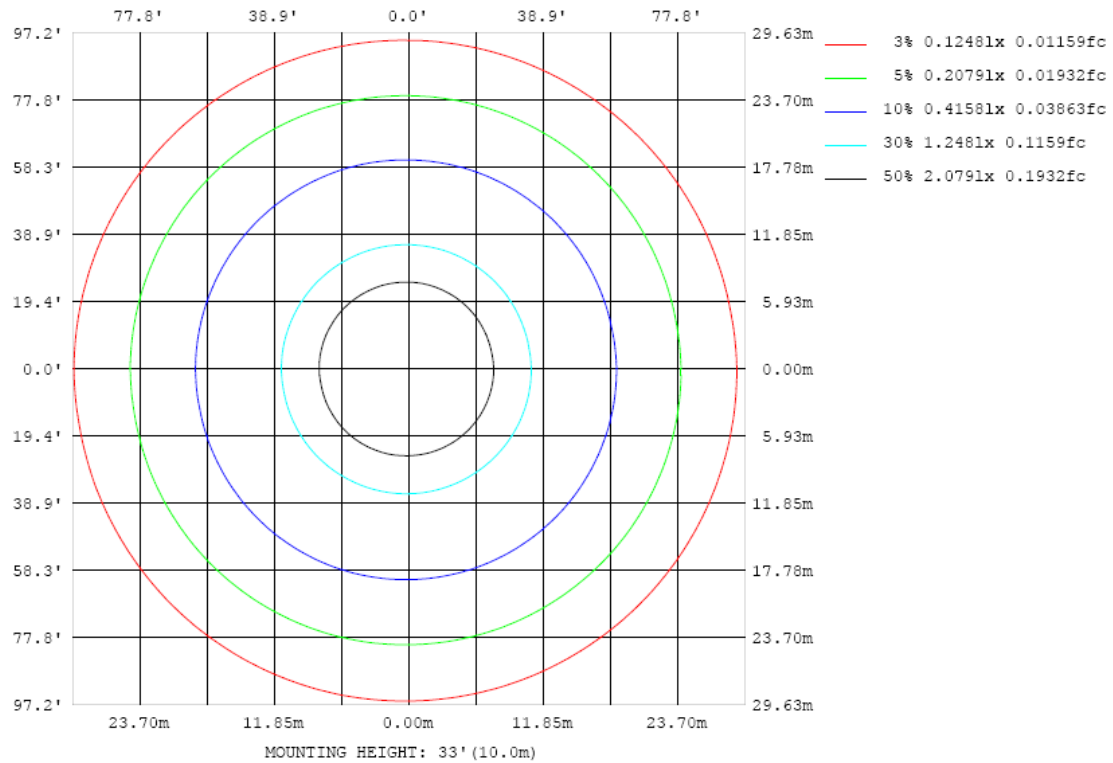


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

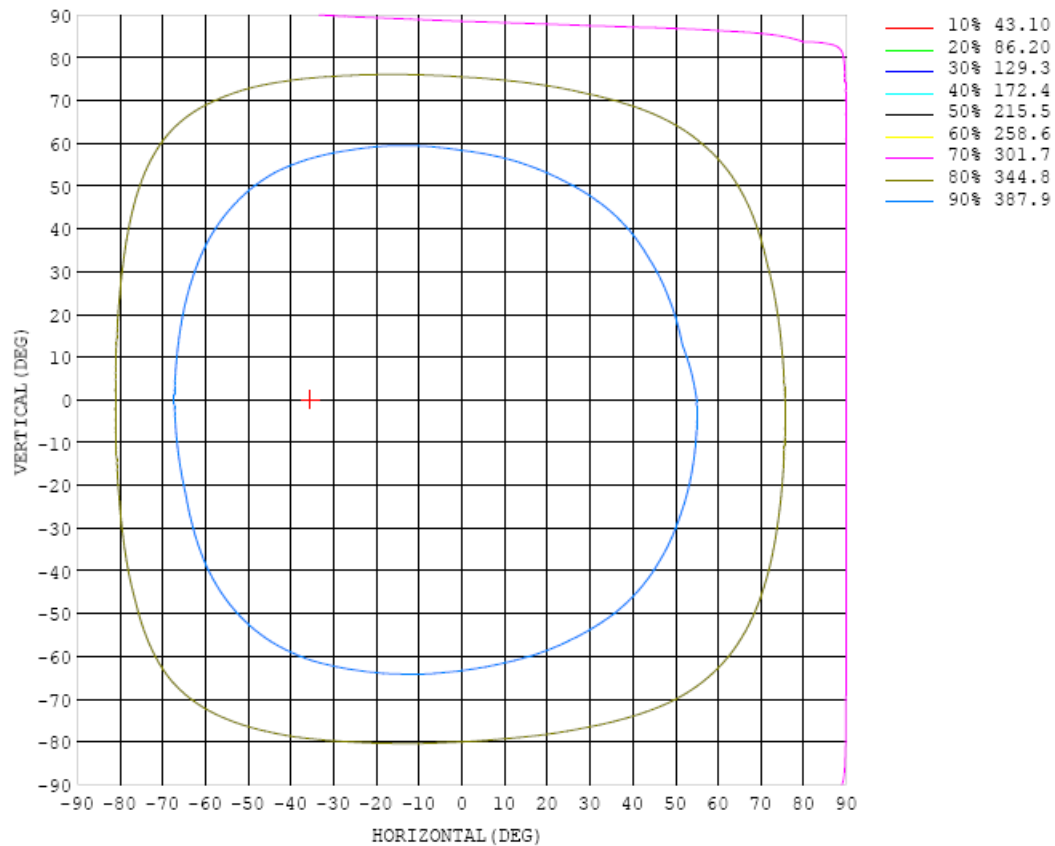


Chart 6: Isocandela Plot

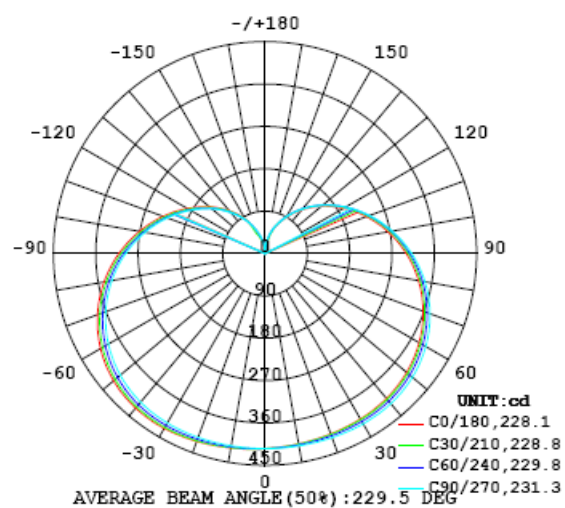


Chart 7: Polar Candela Distribution

## 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	414	414	414	414	414	414	414	414	414	414	414	414	414	414	414	414	414	414	414
5	412	412	413	413	413	413	413	414	414	415	415	415	416	416	416	416	416	417	417
10	411	411	411	411	412	412	413	414	414	415	416	416	417	418	418	418	419	419	419
15	409	409	409	410	411	411	412	413	414	416	417	418	419	420	420	421	421	422	422
20	408	408	408	409	410	411	412	414	415	416	418	419	421	422	423	424	424	424	425
25	407	407	408	408	409	410	412	414	415	417	419	420	422	424	425	426	426	427	427
30	406	406	407	408	409	410	412	414	415	418	420	422	424	425	427	428	428	429	429
35	404	405	405	406	408	409	411	413	415	417	420	422	424	426	427	428	429	430	429
40	402	402	403	404	406	407	409	412	414	416	419	421	423	425	427	428	428	429	428
45	398	399	400	401	402	404	406	408	411	413	416	418	421	423	424	425	426	426	425
50	393	394	395	396	398	399	402	404	406	409	412	414	416	418	420	420	421	421	421
55	386	387	388	390	391	393	395	398	400	403	405	407	410	412	413	414	414	414	413
60	378	379	380	382	383	385	387	390	392	395	397	399	402	403	404	405	405	405	404
65	369	370	371	372	374	376	378	380	382	385	387	389	391	393	393	394	394	393	393
70	358	359	360	361	363	365	367	369	371	373	375	377	379	380	381	381	381	380	379
75	345	346	348	349	351	352	354	356	358	360	362	363	365	366	366	366	366	365	364
80	331	333	334	335	337	338	340	342	343	345	347	348	349	350	350	350	350	349	348
85	316	318	319	321	322	323	325	326	327	329	330	331	332	333	333	332	332	331	330
90	300	302	303	305	306	307	308	310	311	312	313	314	314	314	314	314	313	312	311
95	283	285	286	288	289	290	291	292	293	294	295	295	295	295	295	294	294	293	291
100	266	267	269	270	271	272	273	274	274	275	275	276	276	276	275	274	273	273	271
105	248	249	251	252	252	253	254	255	255	256	256	256	256	256	255	254	253	252	251
110	229	231	232	233	234	235	235	236	236	236	237	236	236	236	235	235	234	233	231
115	211	212	214	215	215	216	216	217	217	217	217	216	216	215	215	214	213	212	211
120	193	194	195	196	197	197	198	198	198	198	197	197	197	196	195	194	193	192	191
125	174	175	176	177	178	178	179	179	179	179	178	178	177	176	176	175	174	173	172
130	156	157	158	159	160	160	160	160	160	160	159	159	158	157	157	156	155	154	154
135	138	139	140	141	142	142	142	142	142	142	141	140	140	139	138	137	137	136	137
140	121	122	123	123	124	124	124	124	124	124	123	123	122	121	120	120	119	118	119
145	104	105	106	106	107	107	107	107	107	107	106	105	105	104	103	103	102	101	102
150	87.8	88.7	89.3	89.8	90.4	90.4	90.6	90.4	90.2	90.0	89.4	88.9	88.3	87.6	86.9	86.2	85.5	84.9	84.5
155	72.3	73.0	73.6	74.1	74.4	74.6	74.6	74.5	74.4	74.0	73.7	73.1	72.5	72.0	71.3	70.6	70.1	69.5	64.0
160	58.5	59.0	59.6	60.0	60.2	60.4	60.5	60.4	60.3	60.0	59.6	59.1	58.6	58.0	57.4	56.8	56.2	55.7	46.4
165	44.3	34.8	35.8	41.4	44.0	43.0	46.6	46.6	46.4	46.2	45.9	45.5	45.0	43.8	43.0	43.3	42.8	41.7	33.3
170	29.7	24.0	20.7	23.4	22.0	28.7	30.6	32.7	33.3	33.8	33.6	33.3	32.5	31.5	30.6	31.3	30.7	28.4	23.3
175	15.6	15.7	14.8	9.41	13.0	14.1	15.7	17.1	18.5	20.9	21.3	21.3	20.3	19.4	18.2	17.8	17.1	17.3	10.3
180	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.70	0.00	0.00	0.00	0.00	0.56	0.56

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	414	414	414	414	414	414	414	414	414	414	414	414	414	414	414	414	414		
5	417	417	416	416	416	415	415	415	414	414	413	413	413	413	412	412	412		
10	419	419	418	418	417	417	416	415	415	414	413	412	412	411	411	410	410		
15	422	421	421	420	419	418	417	416	415	414	413	412	411	410	410	409	409		
20	424	424	423	422	421	420	418	417	416	414	413	412	410	410	409	408	408		
25	427	426	425	424	423	421	419	418	416	414	412	411	410	409	408	407	407		
30	428	427	426	425	423	422	420	418	416	414	412	410	409	408	407	406	406		
35	429	428	426	425	423	421	419	417	415	413	410	409	407	406	405	404	404		
40	428	426	425	423	421	419	417	414	412	410	408	406	405	403	402	402	402		
45	425	423	422	420	417	415	413	410	408	406	404	402	400	399	398	398	398		
50	419	418	416	414	412	410	407	404	402	400	398	396	395	394	393	392	393		
55	412	410	409	407	404	402	399	397	394	392	390	389	387	386	386	385	386		
60	403	401	399	397	394	392	390	387	385	383	381	380	378	377	377	377	378		
65	391	389	388	385	383	381	378	376	374	372	370	369	368	367	367	367	368		
70	378	376	374	372	369	367	365	363	361	359	357	356	356	355	355	356	357		
75	363	361	359	357	355	353	350	348	347	345	344	343	342	342	342	343	344		
80	346	344	343	341	338	337	334	333	331	329	328	328	327	328	328	329	330		
85	328	327	325	323	321	319	317	316	314	313	312	312	312	312	313	314	315		
90	309	308	306	304	303	301	299	298	297	296	295	295	295	295	296	298	299		
95	290	288	287	285	283	282	280	279	278	277	277	277	277	278	279	280	282		
100	270	269	267	265	264	263	261	260	259	259	258	259	259	260	261	263	264		
105	250	248	247	246	244	243	242	241	240	240	240	240	241	242	243	245	246		
110	230	229	227	226	225	224	223	222	221	221	221	222	222	223	225	226	228		
115	210	209	208	206	205	204	203	203	202	202	202	203	204	205	206	208	210		
120	190	189	188	187	186	185	185	184	184	184	184	185	185	187	188	189	191		
125	171	170	169	168	167	167	166	166	165	165	165	166	167	168	170	171	173		
130	153	153	152	151	150	150	149	149	148	148	149	150	150	152	153	154	155		
135	136	135	134	133	133	132	131	131	131	131	131	132	133	134	135	137	138		
140	118	117	117	116	115	114	114	114	114	114	114	115	116	117	118	120	121		
145	101	101	100	99.3	98.6	97.9	97.5	97.1	96.9	97.2	97.5	98.1	99.0	100	101	103	104		
150	84.7	84.1	83.7	81.9	82.4	81.9	81.3	81.0	81.0	81.1	81.5	82.1	82.9	84.0	85.3	86.4	88.0		
155	65.2	67.2	55.2	63.6	65.6	66.7	66.2	66.0	65.9	66.0	66.4	67.1	67.7	68.8	70.0	70.9	72.4		
160	40.3	39.1	40.3	48.2	49.5	50.8	51.8	51.9	51.9	52.0	52.3	52.9	53.6	54.5	55.5	56.5	57.6		
165	32.0	30.3	30.5	33.4	36.1	36.8	37.6	38.4	39.0	39.2	39.5	40.0	40.6	41.4	42.3	43.2	44.1		
170	23.0	21.5	21.2	21.8	23.2	24.6	25.0	25.4	26.0	27.1	27.5	28.1	28.7	29.5	30.2	30.3	30.6		
175	10.6	10.8	10.4	9.80	9.15	8.57	9.22	10.5	11.6	12.4	13.2	13.9	14.2	14.6	15.3	14.7	15.5		
180	0.56	0.57	0.57	0.56	0.56	0.56	0.55	0.55	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56		

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  $4\pi$ . 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  $10^\circ$  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 \*\*\*

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement.