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 Downlight

Model: 3N1/9/90/CCTS/DIM120V

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20090003p

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

Review by: April Zou

Engineer: April Zou

Sep. 11, 2020

Approved by: Jim Zhang

Manager: Jim Zhang

Sep. 11, 2020

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: **3N1/9/90/CCTS/DIM120V**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
79.1	1259.1	15.91	0.9908

CCT (K)	CRI	Stabilization Time (Light & Power)
3040	93.1	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	: Sep. 03, 2020
Date of Test	: Sep. 08, 2020
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

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SAMPLE PHOTO

Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Downlight
Model	: 3N1/9/90/CCTS/DIM120V
Electrical Ratings	: 120Vac, 60Hz, 16.5W
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 light down. 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
Voltage frequency (Hz)	60
Test Current (A)	0.134
Power Factor	0.9908
Test Power (W)	15.91
THD A%	12.05
Luminous Efficacy (lm/W)	79.1
Total Luminous Flux (lm)	1259.1
Color Rendering Index (CRI)	93.1
R9	62.5
Correlated Color Temperature (CCT)(K)	3040
Chromaticity Chroma x	0.4332
Chromaticity Chroma y	0.4014
Chromaticity Chroma u	0.2493
Chromaticity Chroma v	0.3465
Duv	-0.0006
Chromaticity Chroma u ’	0.2493
Chromaticity Chroma v’	0.5198

Special Color Rendering Indices	
R1	93.4
R2	96.4
R3	97.7
R4	93.1
R5	92.9
R6	95
R7	92.7
R8	83.5
R9	62.5
R10	90.5
R11	93.7
R12	80.1
R13	94.3
R14	98.1

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 25.4 ℃.

The photometric distance is 2.47 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)	0.134
Power Factor	0.9905
Power (W)	15.94
Luminous Efficacy (lm/W)	80.2
Total Luminous Flux (lm)	1277.6
Beam Angle (°)	112.8 (0^o-180^o) / 112.8 (90^o-270^o)
Center Beam Candle Power (cd)	443
Maximum Beam Candle Power (cd)	443.8 (At: C=220.0, Gamma=2.0)
Spacing Criteria	1.27 (0^o-180^o) / 1.28 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	78.40%
Zonal Lumens in the 60 °-90 °Zone	21.23%
Zonal Lumens in the 90 °-120 °Zone	0.11%
Zonal Lumens in the 120 °-180 °Zone	0.25%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

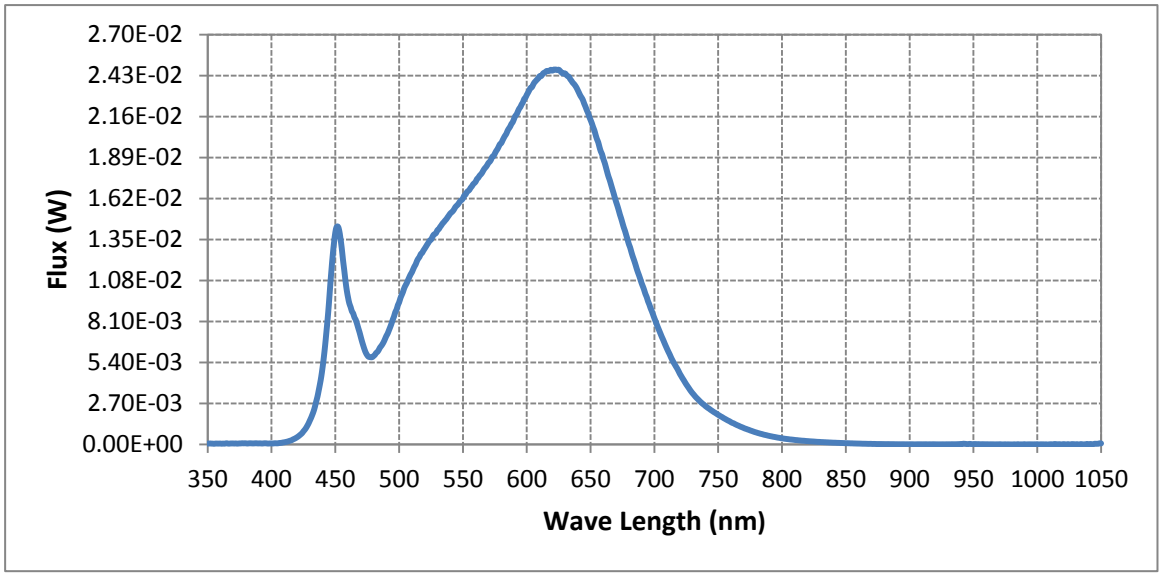
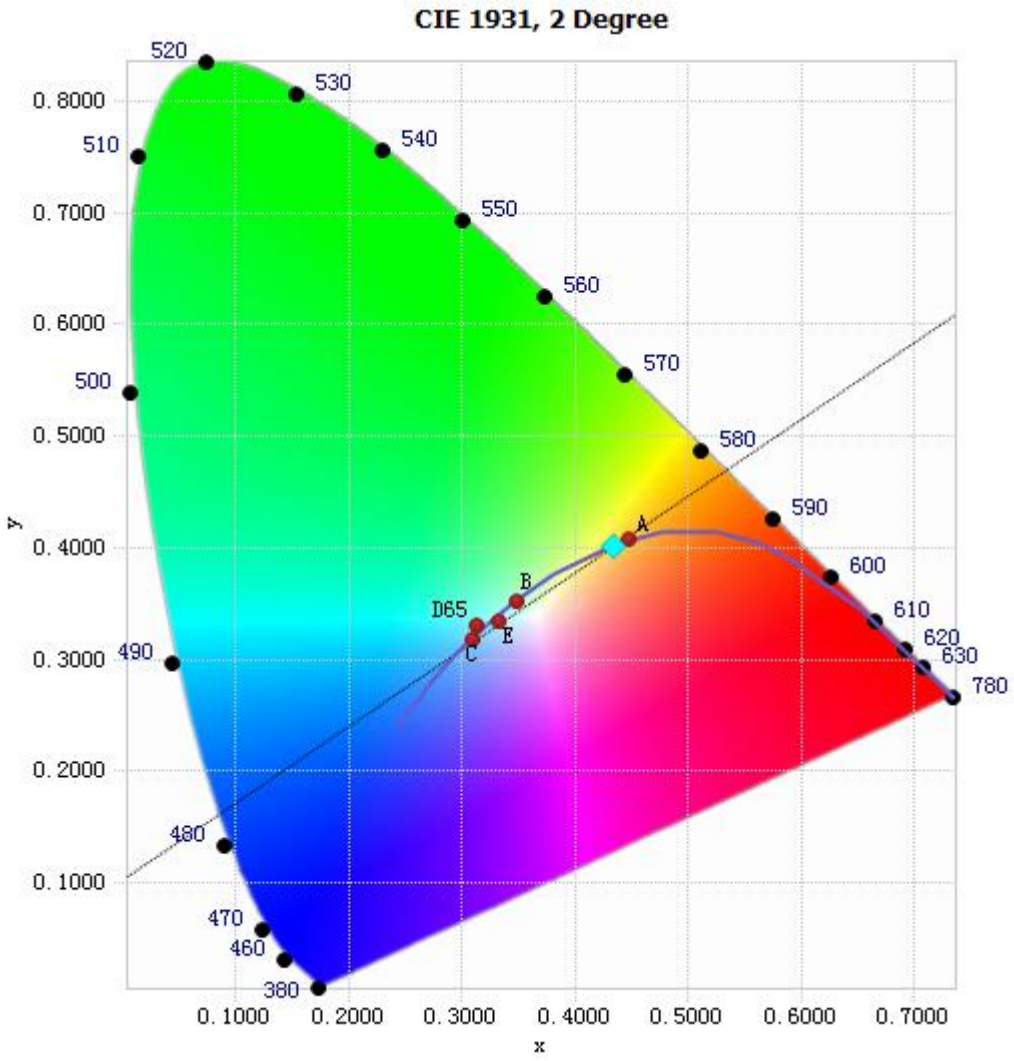


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	7.55E-05	485	6.39E-03	590	2.14E-02	695	9.44E-03
385	7.05E-05	490	7.15E-03	595	2.22E-02	700	8.32E-03
390	7.00E-05	495	8.22E-03	600	2.30E-02	705	7.26E-03
395	7.97E-05	500	9.36E-03	605	2.37E-02	710	6.29E-03
400	6.82E-05	505	1.05E-02	610	2.43E-02	715	5.41E-03
405	7.92E-05	510	1.13E-02	615	2.46E-02	720	4.65E-03
410	1.44E-04	515	1.22E-02	620	2.46E-02	725	3.96E-03
415	2.60E-04	520	1.29E-02	625	2.47E-02	730	3.37E-03
420	4.76E-04	525	1.35E-02	630	2.45E-02	735	2.91E-03
425	8.64E-04	530	1.41E-02	635	2.40E-02	740	2.53E-03
430	1.57E-03	535	1.46E-02	640	2.33E-02	745	2.23E-03
435	2.82E-03	540	1.52E-02	645	2.25E-02	750	1.95E-03
440	5.07E-03	545	1.57E-02	650	2.14E-02	755	1.70E-03
445	9.31E-03	550	1.62E-02	655	2.01E-02	760	1.47E-03
450	1.40E-02	555	1.68E-02	660	1.88E-02	765	1.27E-03
455	1.30E-02	560	1.73E-02	665	1.74E-02	770	1.09E-03
460	9.67E-03	565	1.79E-02	670	1.60E-02	775	9.28E-04
465	8.37E-03	570	1.85E-02	675	1.46E-02	780	7.88E-04
470	7.07E-03	575	1.92E-02	680	1.32E-02		
475	5.88E-03	580	1.99E-02	685	1.19E-02		
480	5.83E-03	585	2.07E-02	690	1.06E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4332, 0.4014)

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

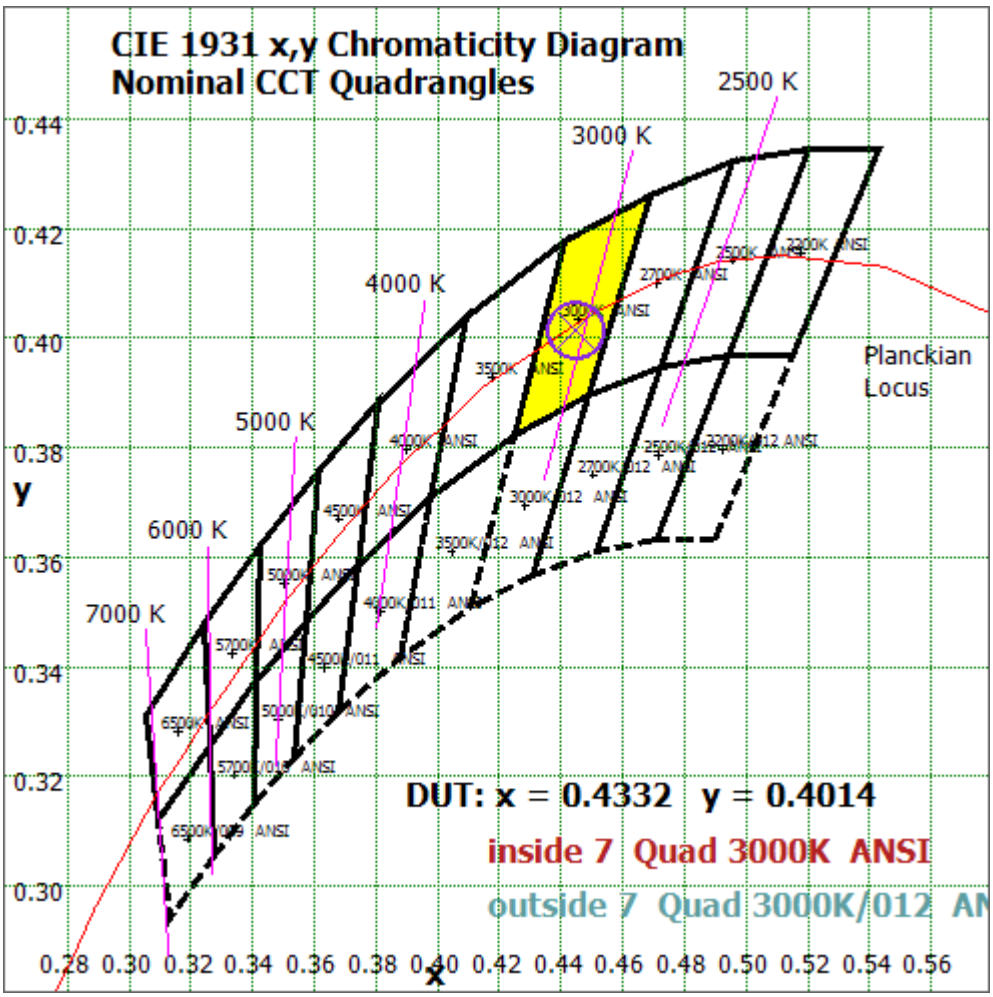


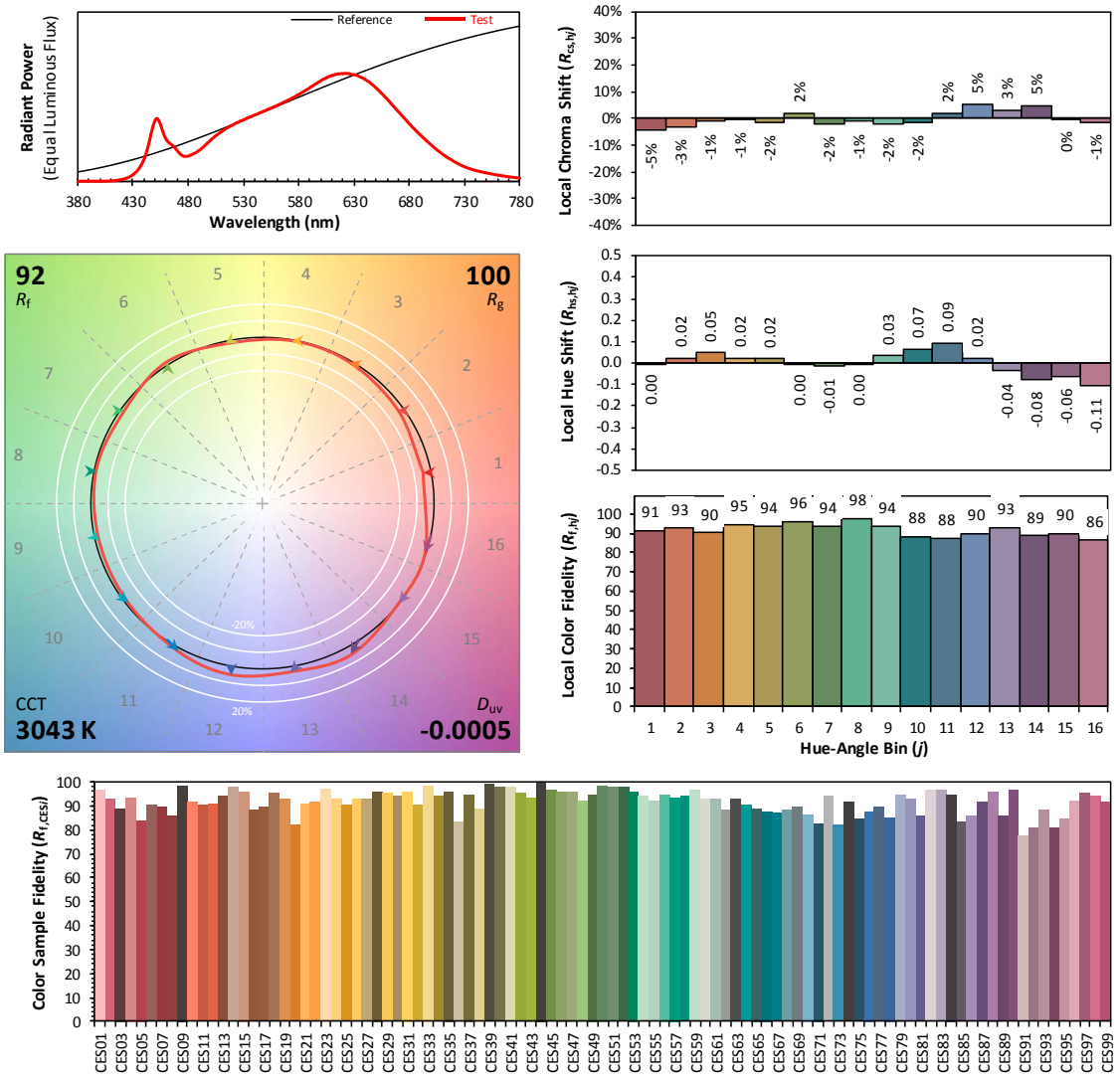
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

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

Date: 2020/09/08 **Model:** 3N1/9/90/CCTS/DIM120V



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

x	0.4332
y	0.4014
u'	0.2493
v'	0.5198

CIE 13.3-1995 (CRI)	
R_a	93
R_9	63

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	41.949	3.28%
10- 20	120.235	9.41%
20- 30	182.505	14.29%
30- 40	220.592	17.27%
40- 50	229.389	17.96%
50- 60	206.99	16.20%
60- 70	157.041	12.29%
70- 80	89.726	7.02%
80- 90	24.456	1.91%
90-100	0.476	0.04%
100-110	0.421	0.03%
110-120	0.553	0.04%
120-130	0.662	0.05%
130-140	0.72	0.06%
140-150	0.707	0.06%
150-160	0.614	0.05%
160-170	0.423	0.03%
170-180	0.115	0.01%
Total	1277.6	100%

γ(°)	Lumens	% Total
0- 60	1001.66	78.40%
60- 90	271.223	21.23%
0-90	1272.883	99.63%
90- 180	4.691	0.37%
0- 180	1277.6	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

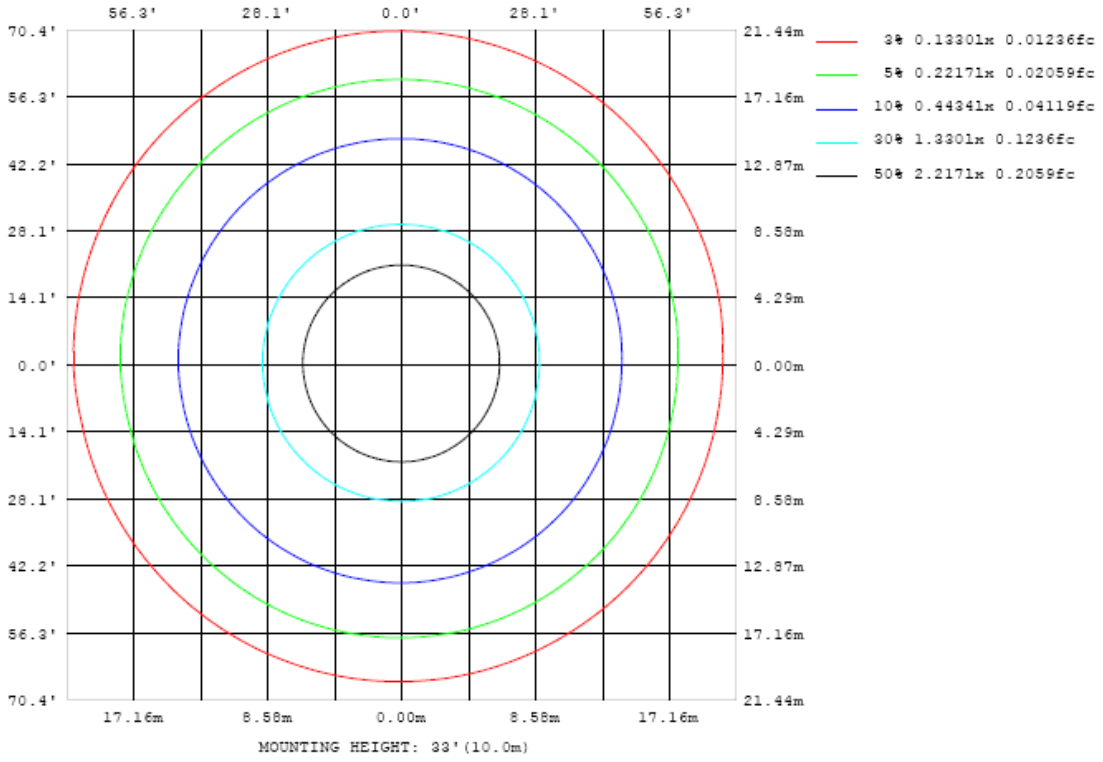


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

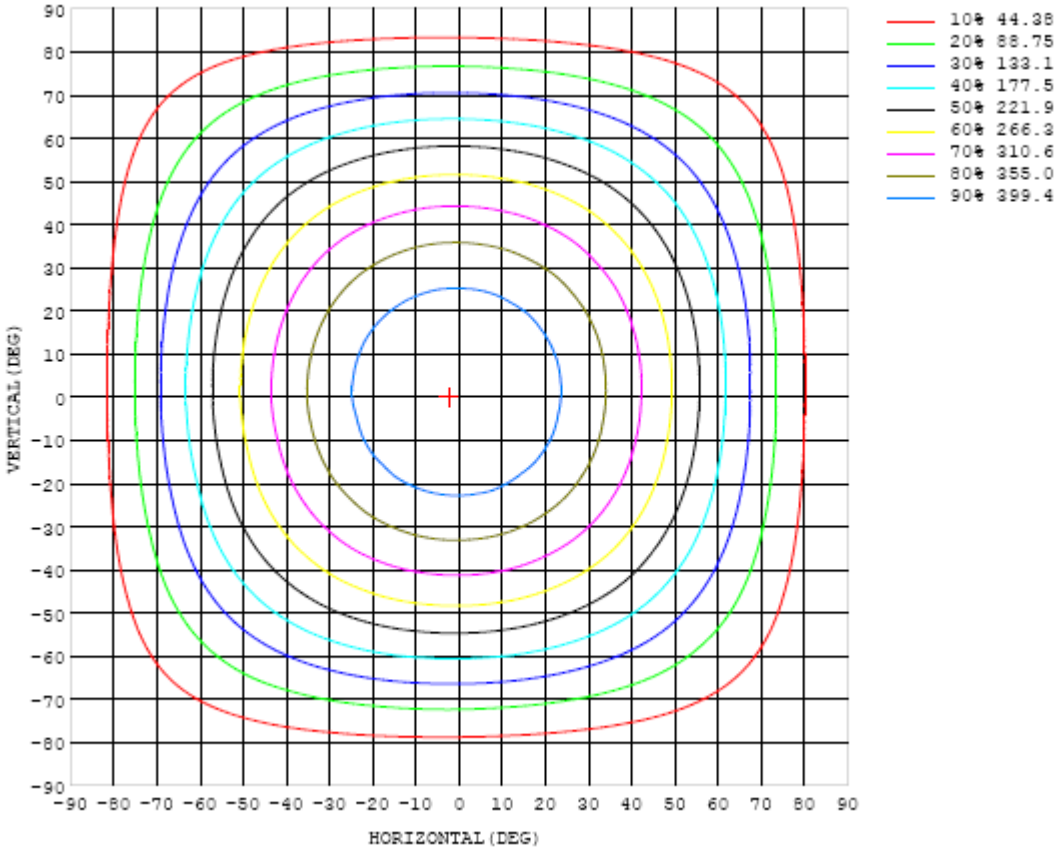


Chart 6: Isocandela Plot

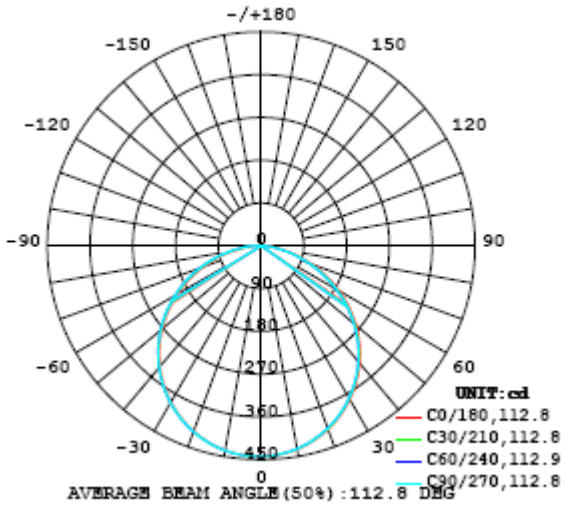


Chart 7: Polar Candela Distribution

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	443	443	443	443	443	443	443	443	443	443	443	443	443	443	443	443	443	443	443
5	441	441	441	441	441	440	440	440	441	440	441	441	440	441	441	441	442	441	442
10	435	434	434	434	434	434	433	434	434	434	434	434	434	435	434	435	436	436	437
15	425	424	424	424	423	423	423	423	423	423	423	424	424	425	424	426	426	426	428
20	411	411	410	409	409	409	408	409	409	409	409	410	410	411	411	412	413	413	415
25	394	393	393	392	392	390	391	391	391	391	391	392	393	394	394	395	396	397	399
30	374	372	372	371	370	370	369	370	370	370	370	371	372	373	374	375	376	377	379
35	350	348	348	347	346	345	345	345	345	346	346	347	348	349	350	352	353	354	357
40	323	322	321	319	319	318	318	318	318	318	319	320	320	323	323	325	327	328	331
45	293	292	291	289	288	288	287	287	288	288	288	290	291	293	294	296	298	299	302
50	261	259	258	257	256	255	254	254	254	255	256	257	258	260	262	264	266	267	271
55	226	224	223	221	220	219	218	219	219	219	220	222	223	225	227	229	232	234	238
60	190	187	186	184	183	182	181	181	181	182	183	185	186	188	190	193	195	198	202
65	152	150	148	146	145	143	143	143	143	144	145	146	148	150	152	155	158	160	165
70	114	112	110	108	107	106	105	105	105	106	107	108	110	112	114	117	120	122	128
75	78.4	76.0	74.0	72.3	70.9	69.8	69.1	69.0	69.1	69.8	70.8	72.1	73.9	75.8	78.2	80.4	82.8	85.2	90.1
80	45.0	42.7	40.8	39.1	37.7	36.7	36.0	35.6	35.6	36.1	37.1	38.3	39.8	41.8	43.8	46.1	48.6	51.0	55.0
85	16.3	14.2	12.5	10.8	9.51	8.48	8.31	7.66	7.50	7.68	8.09	9.11	10.5	12.1	13.9	16.1	18.2	20.4	24.1
90	0.46	0.46	0.44	0.41	0.37	0.33	0.28	0.22	0.17	0.13	0.10	0.08	0.07	0.06	0.05	0.05	0.05	0.08	0.62
95	0.55	0.54	0.52	0.50	0.46	0.42	0.37	0.31	0.26	0.21	0.17	0.15	0.13	0.12	0.11	0.12	0.12	0.11	0.10
100	0.63	0.62	0.61	0.58	0.54	0.50	0.45	0.40	0.32	0.27	0.22	0.19	0.17	0.16	0.15	0.14	0.15	0.13	0.13
105	0.72	0.72	0.70	0.68	0.64	0.59	0.54	0.50	0.40	0.34	0.27	0.24	0.22	0.21	0.20	0.18	0.17	0.16	0.16
110	0.84	0.83	0.81	0.78	0.74	0.70	0.67	0.63	0.51	0.43	0.34	0.30	0.28	0.27	0.25	0.23	0.22	0.21	0.21
115	0.94	0.94	0.92	0.87	0.84	0.81	0.82	0.77	0.66	0.54	0.44	0.39	0.36	0.34	0.32	0.30	0.28	0.28	0.26
120	1.04	1.03	1.01	0.98	0.94	0.92	0.96	0.92	0.81	0.66	0.53	0.47	0.44	0.41	0.39	0.38	0.37	0.38	0.35
125	1.14	1.13	1.11	1.08	1.05	1.05	1.12	1.06	0.95	0.77	0.62	0.55	0.51	0.48	0.44	0.44	0.44	0.46	0.42
130	1.24	1.23	1.22	1.19	1.17	1.19	1.28	1.23	1.10	0.88	0.70	0.63	0.58	0.54	0.51	0.47	0.43	0.51	0.46
135	1.34	1.34	1.32	1.29	1.30	1.35	1.44	1.39	1.25	0.98	0.79	0.71	0.67	0.63	0.59	0.53	0.55	0.47	0.50
140	1.42	1.41	1.40	1.40	1.44	1.53	1.62	1.55	1.39	1.08	0.87	0.79	0.75	0.71	0.67	0.61	0.60	0.54	0.49
145	1.47	1.47	1.49	1.53	1.60	1.70	1.79	1.71	1.49	1.16	0.95	0.86	0.82	0.78	0.70	0.66	0.65	0.66	0.58
150	1.56	1.59	1.62	1.68	1.78	1.88	1.94	1.85	1.57	1.23	1.02	0.92	0.88	0.83	0.80	0.79	0.77	0.75	0.72
155	1.72	1.76	1.81	1.89	1.98	2.10	2.10	1.95	1.64	1.30	1.10	1.00	0.94	0.87	0.89	0.86	0.84	0.81	0.76
160	1.95	1.99	2.04	2.11	2.21	2.27	2.19	1.97	1.66	1.36	1.18	1.08	0.94	0.88	0.87	0.89	0.86	0.83	0.80
165	2.23	2.26	2.32	2.39	2.40	2.33	2.16	1.93	1.67	1.42	1.26	1.17	1.09	0.99	0.90	0.85	0.83	0.82	0.82
170	2.40	2.41	2.39	2.34	2.26	2.14	2.00	1.82	1.61	1.45	1.33	1.24	1.16	1.11	1.04	0.95	0.87	0.77	0.83
175	1.91	1.91	1.89	1.85	1.81	1.73	1.63	1.51	1.38	1.24	1.05	0.90	0.68	0.55	0.47	0.44	0.43	0.43	0.39
180	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30

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	443	443	443	443	443	443	443	443	443	443	443	443	443	443	443	443	443		
5	442	442	442	442	442	442	442	442	442	442	442	442	442	442	441	442	441		
10	437	437	437	438	437	437	438	437	437	437	437	436	436	436	436	436	435		
15	428	428	428	429	429	429	429	429	429	428	428	427	427	427	426	426	425		
20	415	416	416	416	417	417	417	416	416	416	416	415	415	414	414	413	412		
25	399	400	401	401	401	401	401	401	400	400	400	399	399	398	397	396	395		
30	380	381	381	382	381	382	382	382	381	381	380	379	379	378	377	376	375		
35	357	358	359	360	360	359	360	360	359	358	358	357	357	355	354	353	351		
40	332	333	334	334	335	335	335	334	334	333	333	332	331	329	328	327	325		
45	304	305	306	306	307	307	307	307	307	306	305	303	303	301	300	298	296		
50	273	274	275	276	277	277	277	277	277	275	274	273	272	270	268	266	264		
55	239	241	242	244	244	244	245	244	244	243	242	240	239	236	235	232	230		
60	204	206	207	209	209	210	210	210	209	208	207	205	204	201	199	197	194		
65	168	170	172	173	174	175	175	175	174	173	172	170	168	165	162	160	157		
70	130	132	134	136	137	138	138	138	137	136	135	133	130	128	125	122	119		
75	92.5	94.8	97.0	98.6	100	101	101	101	101	99.7	98.2	96.2	93.9	91.1	88.4	85.4	82.3		
80	57.4	59.8	61.8	63.7	65.0	66.0	66.5	66.6	66.1	65.2	63.8	61.8	59.6	57.0	54.4	51.6	48.8		
85	26.1	28.3	30.2	31.8	33.1	34.0	34.6	34.7	34.4	33.6	32.4	30.8	28.9	26.6	24.6	22.1	19.8		
90	1.92	3.24	4.42	5.48	6.43	7.14	7.59	7.71	7.49	6.95	6.09	5.01	3.72	2.40	1.15	0.58	0.47		
95	0.10	0.09	0.09	0.09	0.09	0.09	0.10	0.14	0.19	0.25	0.32	0.38	0.44	0.49	0.52	0.54	0.56		
100	0.13	0.12	0.12	0.13	0.14	0.15	0.17	0.21	0.26	0.33	0.40	0.46	0.53	0.57	0.61	0.63	0.64		
105	0.15	0.15	0.15	0.16	0.18	0.19	0.22	0.27	0.33	0.42	0.47	0.54	0.61	0.66	0.69	0.71	0.73		
110	0.20	0.19	0.19	0.20	0.21	0.23	0.27	0.34	0.41	0.52	0.56	0.62	0.69	0.74	0.77	0.80	0.83		
115	0.25	0.25	0.24	0.25	0.27	0.28	0.31	0.42	0.50	0.64	0.65	0.70	0.76	0.81	0.85	0.88	0.91		
120	0.35	0.33	0.31	0.31	0.32	0.34	0.37	0.50	0.60	0.77	0.76	0.79	0.85	0.90	0.93	0.96	0.99		
125	0.40	0.38	0.36	0.36	0.38	0.40	0.44	0.60	0.72	0.91	0.90	0.90	0.94	0.98	1.01	1.03	1.07		
130	0.45	0.42	0.43	0.45	0.46	0.48	0.52	0.70	0.86	1.06	1.07	1.03	1.05	1.08	1.10	1.12	1.16		
135	0.48	0.46	0.49	0.52	0.54	0.56	0.61	0.80	1.00	1.21	1.26	1.19	1.18	1.19	1.20	1.23	1.26		
140	0.52	0.53	0.54	0.56	0.60	0.63	0.69	0.90	1.13	1.34	1.45	1.36	1.33	1.31	1.31	1.33	1.36		
145	0.58	0.58	0.59	0.61	0.64	0.68	0.76	0.98	1.25	1.48	1.64	1.54	1.48	1.45	1.42	1.41	1.43		
150	0.67	0.65	0.66	0.68	0.71	0.73	0.81	1.02	1.30	1.56	1.76	1.71	1.63	1.58	1.53	1.51	1.52		
155	0.73	0.71	0.74	0.76	0.78	0.81	0.89	1.06	1.33	1.59	1.80	1.89	1.80	1.75	1.69	1.67	1.68		
160	0.78	0.74	0.78	0.82	0.84	0.88	0.96	1.09	1.33	1.58	1.83	2.00	2.05	1.98	1.92	1.91	1.91		
165	0.81	0.77	0.84	0.88	0.92	0.89	0.91	1.08	1.28	1.49	1.75	1.95	2.09	2.19	2.23	2.22	2.20		
170	0.84	0.74	0.57	0.69	0.85	0.90	0.99	1.15	1.18	1.38	1.56	1.78	1.95	2.06	2.19	2.29	2.36		
175	0.39	0.38	0.36	0.31	0.32	0.36	0.42	0.53	0.68	0.91	1.11	1.39	1.58	1.71	1.80	1.86	1.91		
180	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30		

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, 2020	Aug. 04, 2021
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2020	Aug. 04, 2021
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2020	Aug. 04, 2021
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2020	Aug. 04, 2021
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2020	Aug. 04, 2021
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2020	Aug. 04, 2021
Standard source	D908	HZTE012-01	Aug. 05, 2020	Aug. 04, 2021
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2020	Aug. 04, 2021
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2020	Aug. 04, 2021
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2020	Aug. 04, 2021
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2020	Aug. 04, 2021
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2020	Aug. 04, 2021
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2020	Aug. 04, 2021
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2020	Aug. 04, 2021

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

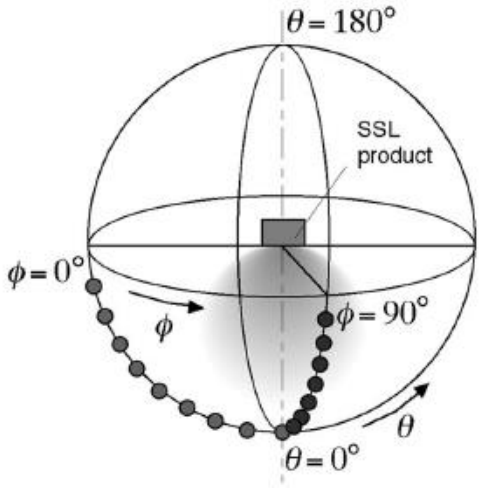
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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