

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/DIM010UNV

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20090003o

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

Review by:



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Sep. 11, 2020

Approved by:



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/DIM010UNV

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
77.5	1252.5	16.16	0.9871
CCT (K)	CRI	Stabilization Time (Light & Power)	
3025	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/DIM010UNV
Electrical Ratings	: 120-277Vac, 50/60Hz, 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 °C.

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)	0.136
Power Factor	0.9871
Test Power (W)	16.16
THD A%	9.68
Luminous Efficacy (lm/W)	77.5
Total Luminous Flux (lm)	1252.5
Color Rendering Index (CRI)	93.1
R9	62.2
Correlated Color Temperature (CCT)(K)	3025
Chromaticity Chroma x	0.4343
Chromaticity Chroma y	0.4018
Chromaticity Chroma u	0.2498
Chromaticity Chroma v	0.3467
Duv	-0.0006
Chromaticity Chroma u'	0.2498
Chromaticity Chroma v'	0.5201

Special Color Rendering Indices	
R1	93.3
R2	96.4
R3	97.7
R4	93.1
R5	92.9
R6	95.1
R7	92.6
R8	83.3
R9	62.2
R10	90.5
R11	93.7
R12	80.2
R13	94.2
R14	98.2

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 25.2 °C.

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)	0.137
Power Factor	0.9872
Power (W)	16.21
Luminous Efficacy (lm/W)	78.1
Total Luminous Flux (lm)	1265.2
Beam Angle (°)	112.9 (0°-180°) / 112.8 (90°-270°)
Center Beam Candle Power (cd)	440
Maximum Beam Candle Power (cd)	440.6 (At: C=300.0, Gamma=1.0)
Spacing Criteria	1.24 (0°-180°) / 1.27 (90°-270°)
Zonal Lumens in the 0°-60° Zone	78.60%
Zonal Lumens in the 60°-90° Zone	21.28%
Zonal Lumens in the 90°-120° Zone	0.04%
Zonal Lumens in the 120°-180° Zone	0.09%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

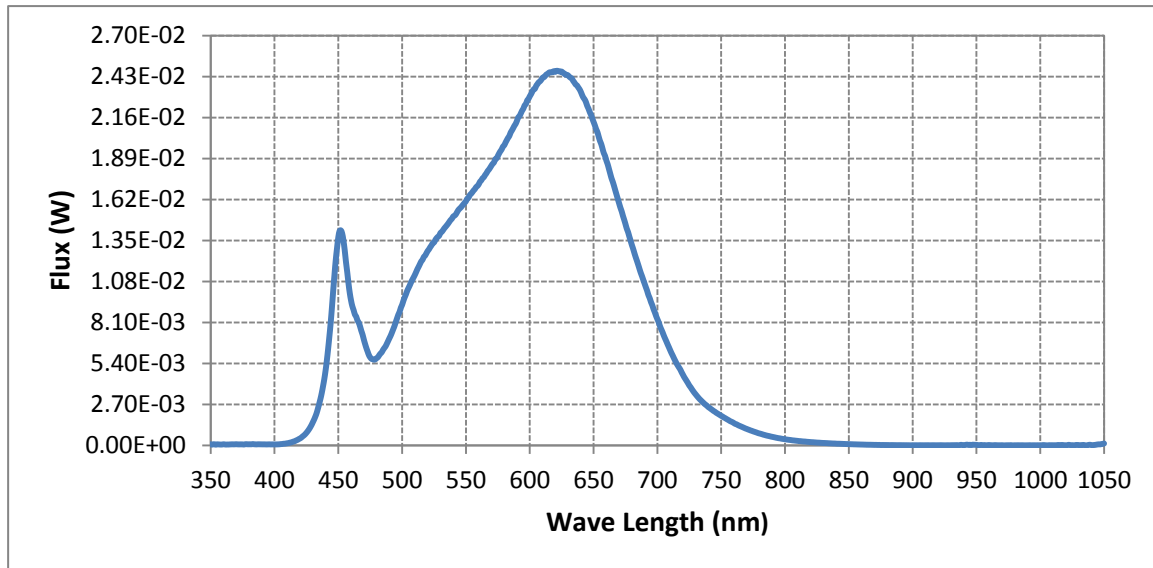
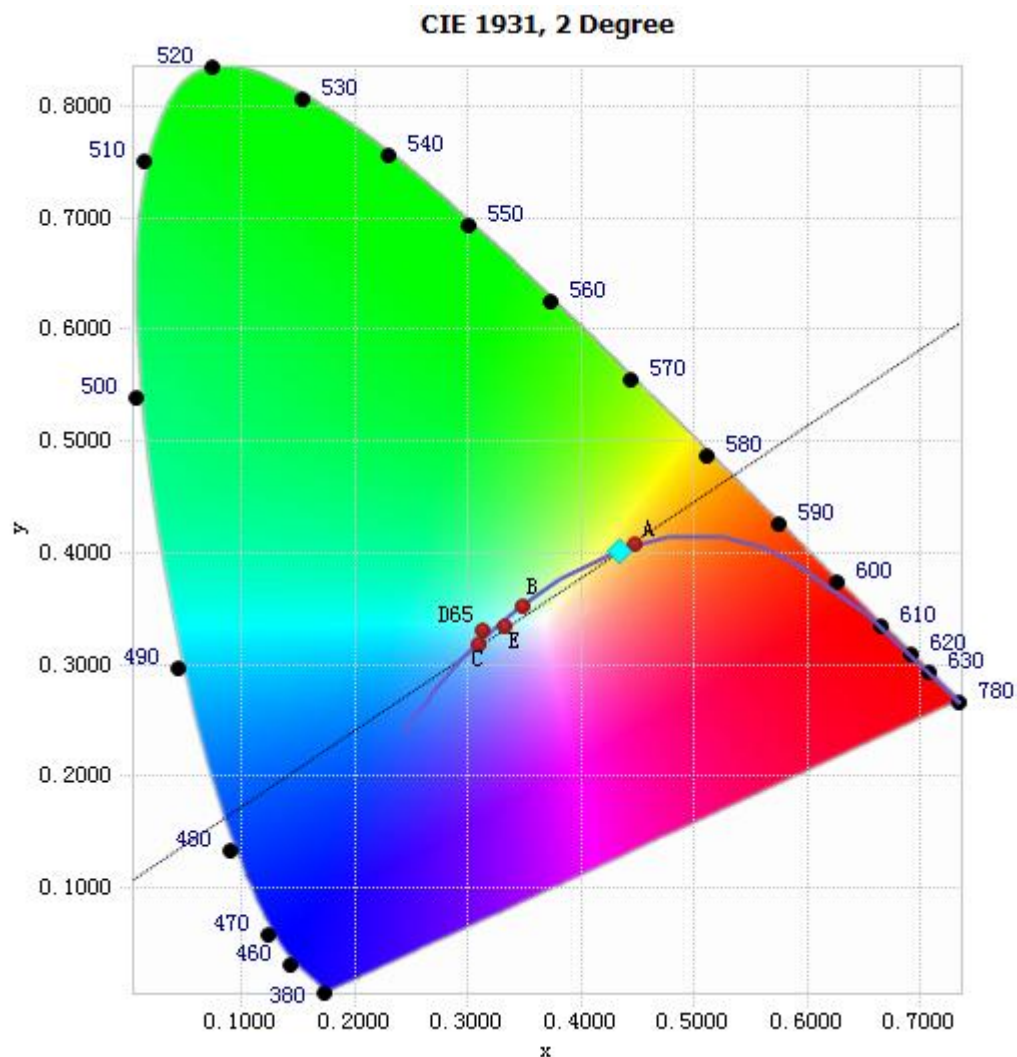


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	7.87E-05	485	6.29E-03	590	2.14E-02	695	9.45E-03
385	7.56E-05	490	7.06E-03	595	2.22E-02	700	8.32E-03
390	7.53E-05	495	8.12E-03	600	2.30E-02	705	7.25E-03
395	7.34E-05	500	9.27E-03	605	2.37E-02	710	6.28E-03
400	7.02E-05	505	1.04E-02	610	2.42E-02	715	5.41E-03
405	9.13E-05	510	1.12E-02	615	2.46E-02	720	4.67E-03
410	1.47E-04	515	1.21E-02	620	2.46E-02	725	3.96E-03
415	2.63E-04	520	1.28E-02	625	2.46E-02	730	3.37E-03
420	4.64E-04	525	1.34E-02	630	2.44E-02	735	2.90E-03
425	8.34E-04	530	1.40E-02	635	2.39E-02	740	2.52E-03
430	1.52E-03	535	1.45E-02	640	2.33E-02	745	2.23E-03
435	2.74E-03	540	1.51E-02	645	2.24E-02	750	1.95E-03
440	4.94E-03	545	1.56E-02	650	2.13E-02	755	1.71E-03
445	9.10E-03	550	1.61E-02	655	2.01E-02	760	1.47E-03
450	1.37E-02	555	1.67E-02	660	1.88E-02	765	1.27E-03
455	1.29E-02	560	1.72E-02	665	1.74E-02	770	1.09E-03
460	9.54E-03	565	1.78E-02	670	1.60E-02	775	9.30E-04
465	8.24E-03	570	1.84E-02	675	1.46E-02	780	7.91E-04
470	6.98E-03	575	1.91E-02	680	1.32E-02		
475	5.80E-03	580	1.98E-02	685	1.19E-02		
480	5.75E-03	585	2.06E-02	690	1.07E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4343, 0.4018)

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

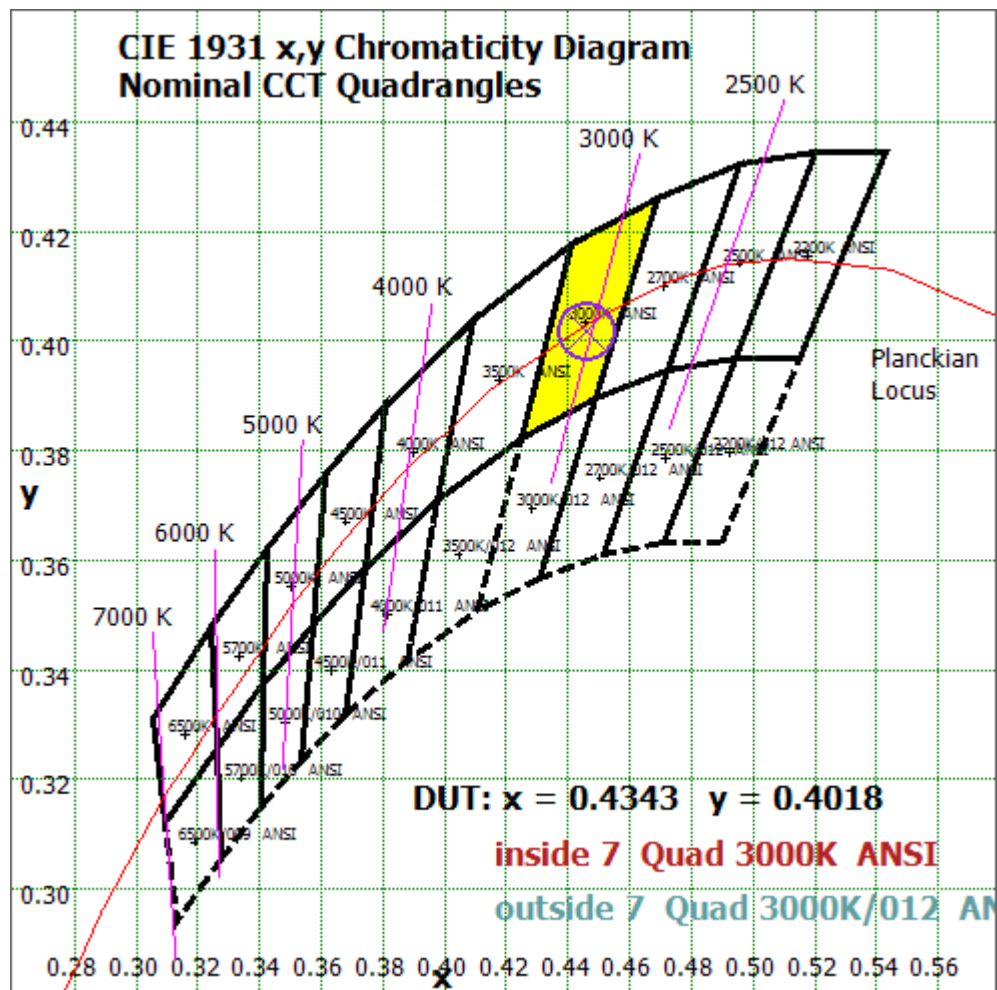


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

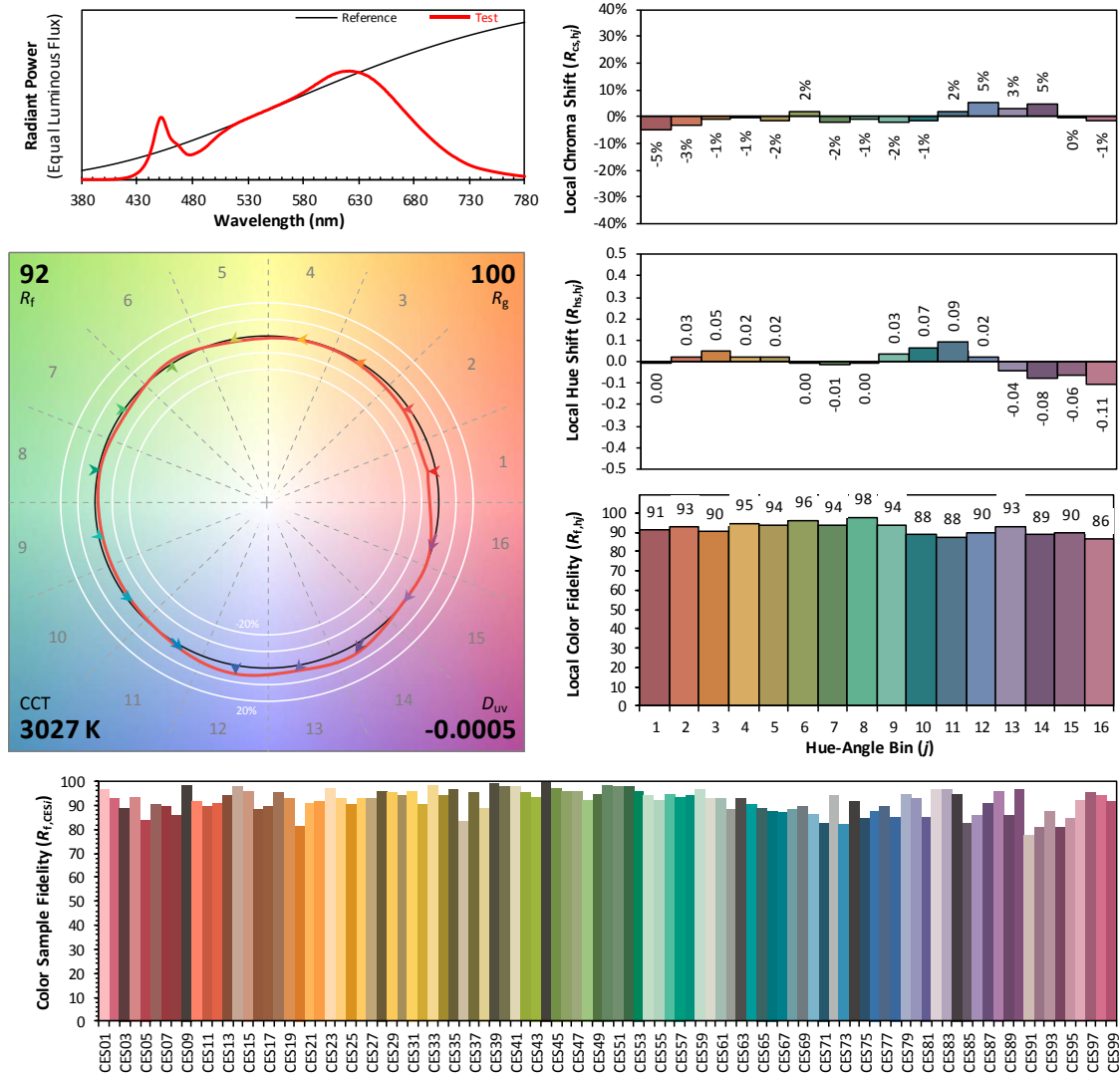
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2020/09/08

Model: 3N1/9/90/CCTS/DIM010UNV



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

x 0.4343
 y 0.4018
 u' 0.2498
 v' 0.5201

CIE 13.3-1995
(CRI)

R_a 93

R_g 62

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	41.665	3.29%
10- 20	119.403	9.44%
20- 30	181.195	14.32%
30- 40	218.936	17.30%
40- 50	227.648	17.99%
50- 60	205.585	16.25%
60- 70	156.078	12.34%
70- 80	89.189	7.05%
80- 90	23.915	1.89%
90-100	0.17	0.01%
100-110	0.14	0.01%
110-120	0.207	0.02%
120-130	0.245	0.02%
130-140	0.262	0.02%
140-150	0.246	0.02%
150-160	0.196	0.02%
160-170	0.122	0.01%
170-180	0.04	0.00%
Total	1265.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	994.432	78.60%
60- 90	269.182	21.28%
0-90	1263.614	99.87%
90- 180	1.628	0.13%
0- 180	1265.2	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

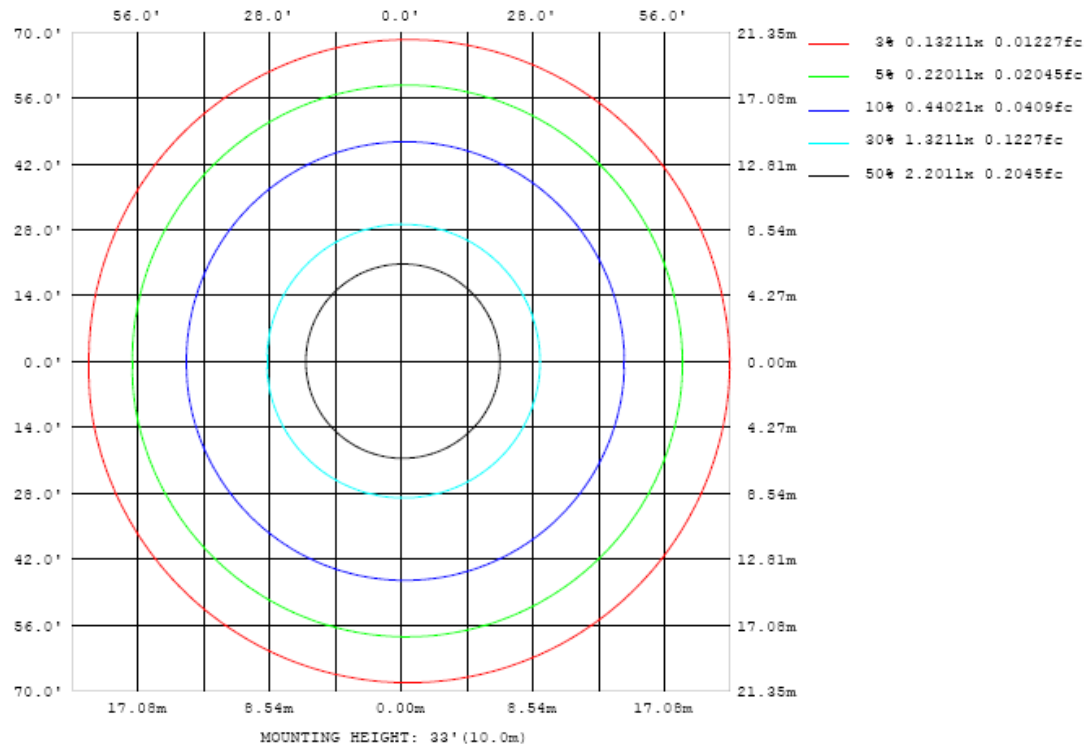


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

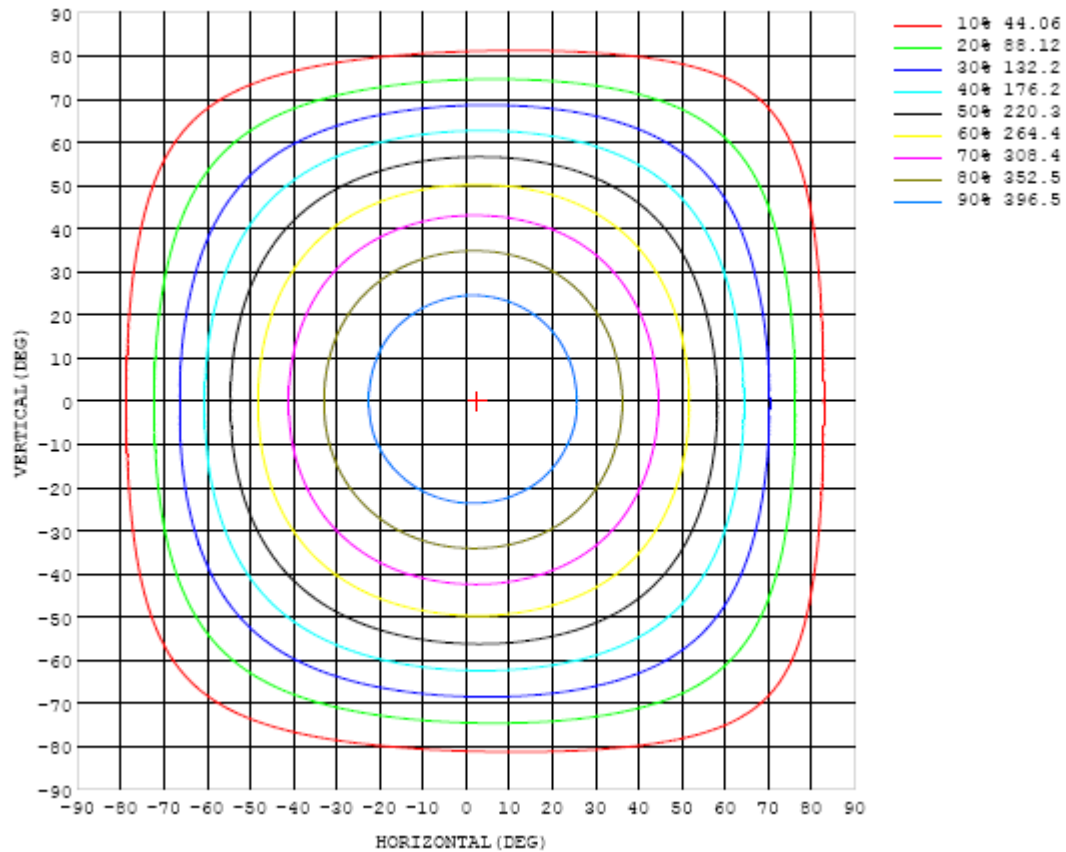


Chart 6: Isocandela Plot

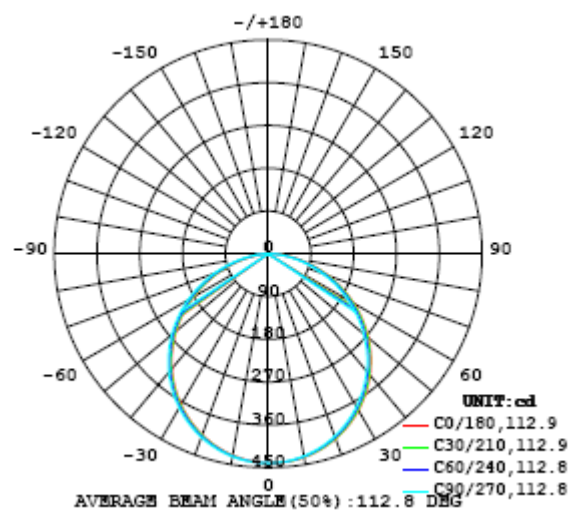


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440
5	439	439	439	439	439	439	439	438	438	438	438	438	438	438	437	437	437	437	437
10	435	435	435	434	434	433	433	432	432	432	432	431	431	431	431	430	431	430	430
15	426	427	426	425	425	425	424	423	422	422	421	421	421	420	420	420	420	420	420
20	414	414	414	413	413	412	411	410	409	408	408	407	407	406	406	406	406	405	405
25	399	399	398	397	397	396	394	393	392	391	391	390	389	389	388	388	388	388	387
30	380	380	379	378	377	376	375	373	372	371	370	369	368	368	367	367	367	367	366
35	358	358	357	356	355	353	352	350	349	348	347	346	345	344	344	343	343	343	342
40	333	333	332	331	330	328	327	325	323	322	320	319	318	317	317	316	316	316	315
45	306	305	304	303	302	300	298	296	295	293	292	290	289	288	287	287	286	286	285
50	275	275	274	273	271	270	267	266	264	262	260	259	257	256	255	254	254	254	253
55	243	242	241	240	238	237	234	232	230	228	227	225	223	222	221	220	219	219	217
60	208	207	206	205	204	202	200	197	195	193	191	189	188	186	185	184	183	183	181
65	172	171	170	169	168	166	164	162	160	158	155	153	151	150	148	147	146	146	143
70	135	134	133	132	131	129	127	125	123	121	118	116	114	112	111	109	108	108	105
75	97.6	97.2	96.4	95.4	94.0	92.4	90.8	88.8	86.6	84.5	82.4	80.2	78.2	76.3	74.7	73.2	72.1	71.3	69.1
80	62.6	62.2	61.5	60.5	59.4	58.0	56.5	54.6	52.8	50.8	48.8	46.7	44.8	42.9	41.3	40.0	39.0	38.2	36.5
85	31.2	30.9	30.4	29.5	28.5	27.3	25.9	24.3	22.6	20.8	19.1	17.3	15.6	14.1	12.7	11.5	10.6	10.1	8.83
90	5.25	5.11	4.76	4.18	3.43	2.49	1.52	0.65	0.21	0.07	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.05
95	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.08	0.09	0.08	0.09	0.09	0.07
100	0.08	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.10	0.11	0.10	0.11	0.11	0.10
105	0.11	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.15	0.15	0.13
110	0.16	0.16	0.15	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.18	0.18	0.19	0.15	0.19	0.21	0.20
115	0.20	0.20	0.19	0.19	0.19	0.19	0.19	0.20	0.20	0.21	0.21	0.21	0.21	0.21	0.21	0.18	0.21	0.23	0.25
120	0.23	0.22	0.21	0.20	0.21	0.22	0.22	0.23	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.27
125	0.25	0.25	0.23	0.23	0.23	0.24	0.24	0.25	0.25	0.25	0.26	0.25	0.25	0.25	0.25	0.25	0.26	0.27	0.32
130	0.29	0.28	0.27	0.26	0.26	0.27	0.27	0.27	0.28	0.28	0.28	0.28	0.28	0.28	0.27	0.28	0.30	0.31	0.36
135	0.31	0.33	0.31	0.29	0.30	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.31	0.29	0.31	0.34	0.35	0.37
140	0.31	0.35	0.35	0.33	0.33	0.34	0.34	0.34	0.35	0.35	0.35	0.35	0.35	0.35	0.29	0.34	0.38	0.34	0.40
145	0.32	0.35	0.37	0.36	0.37	0.37	0.37	0.38	0.38	0.38	0.38	0.38	0.38	0.39	0.32	0.35	0.37	0.36	0.43
150	0.37	0.38	0.38	0.38	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.40	0.38	0.34	0.37	0.44	0.47	0.48
155	0.40	0.39	0.38	0.38	0.41	0.43	0.42	0.43	0.43	0.43	0.43	0.39	0.31	0.31	0.32	0.39	0.46	0.49	0.51
160	0.41	0.41	0.39	0.39	0.41	0.42	0.42	0.43	0.42	0.36	0.33	0.34	0.23	0.26	0.31	0.39	0.48	0.47	0.54
165	0.43	0.42	0.41	0.39	0.41	0.41	0.37	0.35	0.37	0.34	0.32	0.46	0.24	0.16	0.30	0.36	0.54	0.42	0.58
170	0.45	0.44	0.43	0.42	0.41	0.40	0.27	0.27	0.39	0.35	0.31	0.56	0.38	0.02	0.30	0.28	0.55	0.45	0.52
175	0.43	0.44	0.45	0.40	0.40	0.27	0.09	0.30	0.42	0.36	0.30	0.51	0.79	0.22	0.05	0.29	0.26	0.51	0.57
180	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) y (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440	440		
5	437	438	438	438	438	438	438	439	439	439	439	439	439	439	439	440	440		
10	430	431	431	431	432	432	432	433	433	434	434	434	434	435	435	435	435		
15	420	420	421	421	422	422	423	423	424	425	425	426	426	426	426	427	427		
20	406	406	407	407	408	409	409	410	411	412	413	413	414	414	414	414	414		
25	388	388	389	390	391	392	393	394	395	396	396	397	398	398	398	399	399		
30	367	368	369	369	370	371	372	373	375	376	377	378	378	379	379	380	380		
35	343	343	344	346	347	348	349	350	352	353	354	355	356	357	357	357	358		
40	316	317	318	319	320	321	323	324	326	327	328	330	330	331	332	333	333		
45	286	287	288	289	291	292	293	295	297	298	300	301	302	303	304	305	305		
50	253	254	255	257	258	260	262	264	265	267	269	270	272	273	274	274	274		
55	218	219	221	222	224	226	228	230	232	233	235	237	238	240	241	241	241		
60	182	183	184	186	187	189	191	194	196	198	200	202	203	204	205	206	206		
65	144	145	146	148	150	152	154	157	159	161	163	165	166	168	169	170	170		
70	106	107	108	110	112	114	117	119	121	124	126	128	129	131	131	132	132		
75	69.7	70.5	71.9	73.7	75.6	78.0	80.1	82.5	85.0	87.0	89.2	91.1	92.7	93.9	94.9	95.5	95.7		
80	36.8	37.6	38.7	40.4	42.2	44.3	46.5	48.8	51.0	53.2	55.2	57.0	58.5	59.7	60.5	61.0	61.4		
85	9.07	9.64	10.5	11.7	13.1	14.7	16.5	18.4	20.3	22.2	24.0	25.7	27.0	28.2	29.1	29.7	30.0		
90	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.06	0.06	0.06	0.06		
95	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.07	0.07	0.06	0.06	0.06	0.06		
100	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.10	0.10	0.09	0.09	0.08	0.08	0.08		
105	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.12	0.12	0.11	0.11	0.11	0.10		
110	0.20	0.19	0.19	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.15	0.16	0.15	0.15	0.16		
115	0.25	0.24	0.23	0.23	0.23	0.22	0.22	0.22	0.22	0.22	0.21	0.21	0.20	0.20	0.19	0.20	0.21		
120	0.28	0.27	0.26	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.26	0.25	0.24	0.22	0.23	0.24	0.25		
125	0.32	0.31	0.31	0.30	0.31	0.31	0.31	0.31	0.31	0.31	0.30	0.29	0.28	0.26	0.27	0.29	0.29		
130	0.35	0.35	0.35	0.34	0.34	0.34	0.35	0.35	0.35	0.34	0.34	0.33	0.32	0.31	0.29	0.31	0.32		
135	0.40	0.41	0.39	0.38	0.38	0.38	0.38	0.38	0.38	0.37	0.37	0.36	0.36	0.35	0.34	0.32	0.33		
140	0.45	0.44	0.42	0.41	0.41	0.41	0.40	0.40	0.40	0.40	0.40	0.39	0.39	0.38	0.38	0.36	0.33		
145	0.47	0.45	0.43	0.42	0.43	0.42	0.42	0.42	0.42	0.41	0.41	0.41	0.41	0.40	0.40	0.40	0.37		
150	0.47	0.45	0.44	0.44	0.45	0.44	0.43	0.43	0.43	0.43	0.43	0.42	0.42	0.42	0.42	0.42	0.40		
155	0.46	0.46	0.47	0.47	0.48	0.46	0.45	0.45	0.45	0.45	0.45	0.45	0.44	0.44	0.44	0.44	0.42		
160	0.46	0.47	0.48	0.48	0.49	0.48	0.47	0.46	0.47	0.46	0.46	0.46	0.46	0.45	0.45	0.45	0.43		
165	0.47	0.49	0.50	0.51	0.52	0.52	0.50	0.49	0.49	0.49	0.49	0.49	0.49	0.48	0.48	0.48	0.43		
170	0.58	0.49	0.50	0.52	0.53	0.54	0.52	0.51	0.50	0.49	0.49	0.49	0.49	0.49	0.49	0.48	0.45		
175	0.39	0.65	0.48	0.48	0.50	0.51	0.53	0.53	0.53	0.51	0.49	0.45	0.42	0.42	0.41	0.46	0.46		
180	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37		

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.

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° 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 ***

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