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 Low Bay

Model: 35HIDLB/840/BYP/EX39/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20050018d

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

Review by: April Zou

Engineer: April Zou

May 19, 2020

Approved by: Jim Zhang

Manager: Jim Zhang

May 19, 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: **35HIDLB/840/BYP/EX39/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
134.5	4564.0	33.93	0.9774

CCT (K)	CRI	Stabilization Time (Light & Power)
4024	81.6	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 : May 15, 2020

Date of Test : May 18, 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 Low Bay
Model	: 35HIDLB/840/BYP/EX39/R
Electrical Ratings	: 100-277Vac, 50/60Hz, 35W
Product Description	: 4000K
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 25.0 ℃.

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	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.289	0.134
Power Factor	0.9774	0.9142
Test Power (W)	33.93	34.06
THD A%	15.23	11.34
Luminous Efficacy (lm/W)	134.5	133.8
Total Luminous Flux (lm)	4564.0	4556.0
Color Rendering Index (CRI)	81.6	
R9	9.7	
Correlated Color Temperature (CCT)(K)	4024	
Chromaticity Chroma x	0.3795	
Chromaticity Chroma y	0.3768	
Chromaticity Chroma u	0.2245	
Chromaticity Chroma v	0.3343	
Duv	0.0003	
Chromaticity Chroma u ’	0.2245	
Chromaticity Chroma v’	0.5015	

Special Color Rendering Indices	
R1	80
R2	86.6
R3	91.8
R4	81.6
R5	80
R6	81.4
R7	86.4
R8	65.9
R9	9.7
R10	68.3
R11	80.1
R12	59.9
R13	81.3
R14	95.3

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 24.7 ℃.

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)	0.291
Power Factor	0.9742
Power (W)	34.00
Luminous Efficacy (lm/W)	135.2
Total Luminous Flux (lm)	4595.0
Beam Angle (°)	112.8 (0^o-180^o) / 113.3 (90^o-270^o)
Center Beam Candle Power (cd)	1485
Maximum Beam Candle Power (cd)	1510 (At: C=350.0, Gamma=6.0)
Spacing Criteria	1.34 (0^o-180^o) / 1.32 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	76.04%
Zonal Lumens in the 60 °-90 °Zone	16.38%
Zonal Lumens in the 90 °-120 °Zone	1.89%
Zonal Lumens in the 120 °-180 °Zone	5.68%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

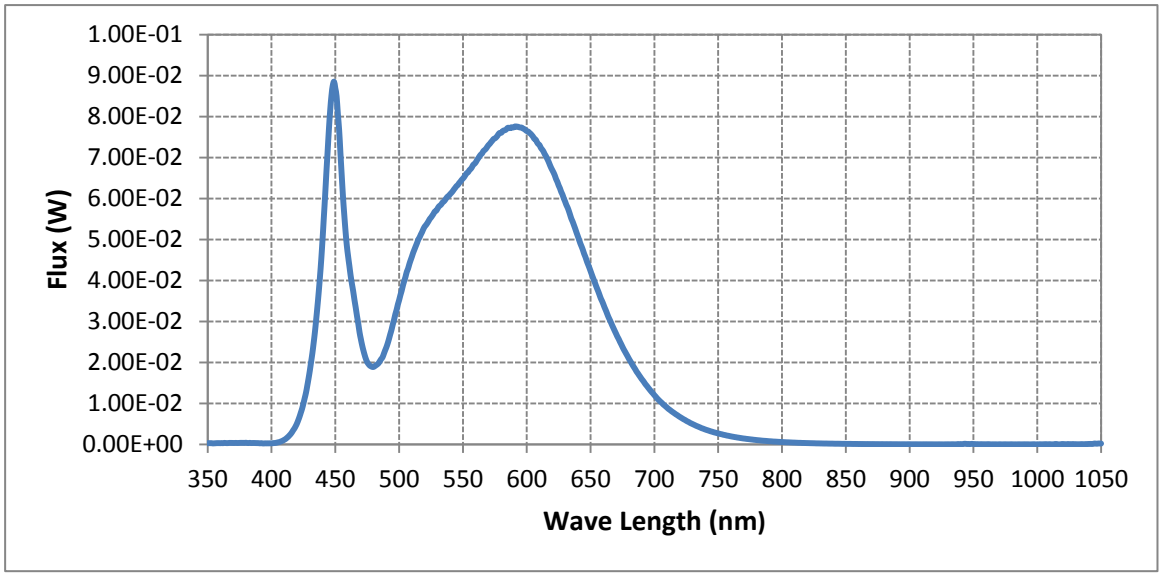
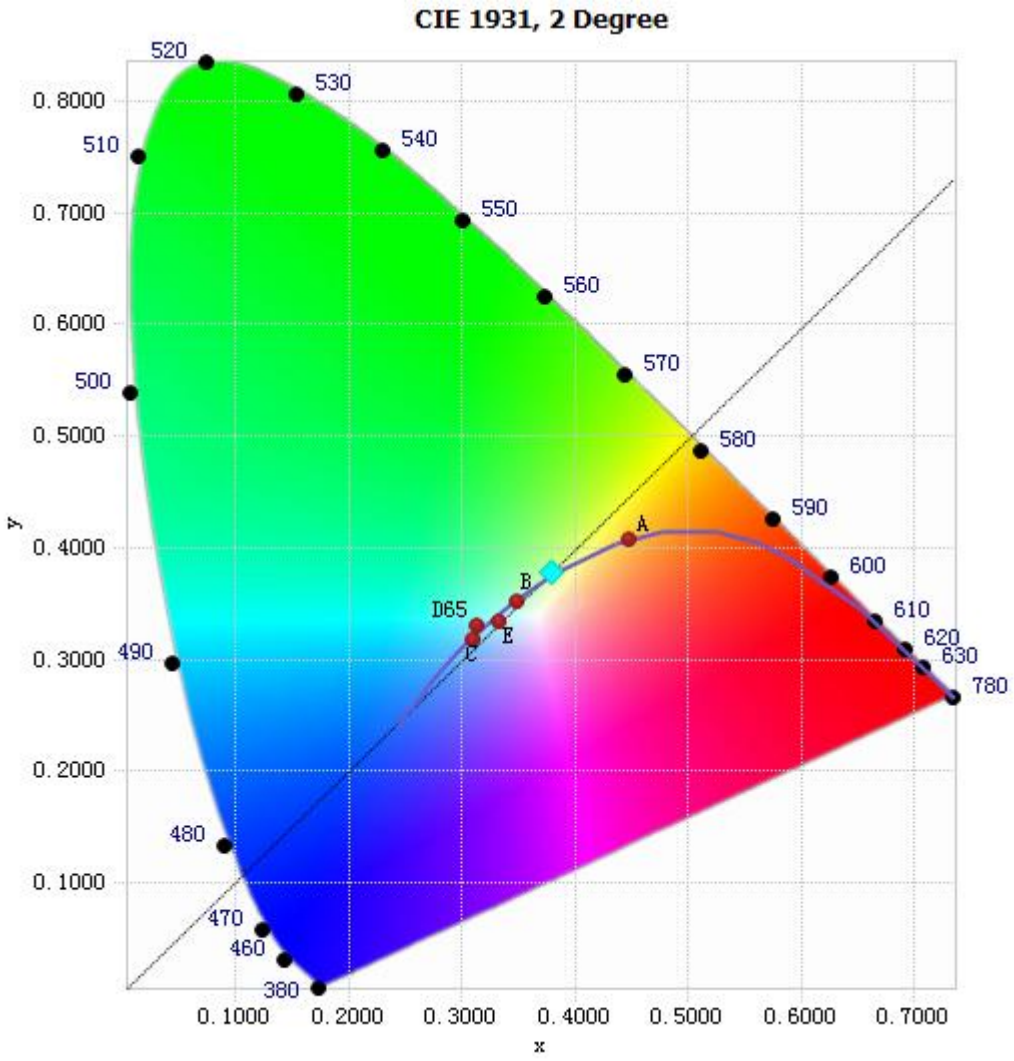


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.22E-04	485	2.04E-02	590	7.74E-02	695	1.39E-02
385	3.59E-04	490	2.37E-02	595	7.74E-02	700	1.20E-02
390	3.23E-04	495	2.93E-02	600	7.65E-02	705	1.04E-02
395	2.80E-04	500	3.52E-02	605	7.51E-02	710	8.97E-03
400	2.81E-04	505	4.09E-02	610	7.31E-02	715	7.78E-03
405	5.19E-04	510	4.58E-02	615	7.04E-02	720	6.72E-03
410	1.14E-03	515	5.00E-02	620	6.70E-02	725	5.78E-03
415	2.55E-03	520	5.31E-02	625	6.32E-02	730	4.97E-03
420	5.16E-03	525	5.54E-02	630	5.93E-02	735	4.26E-03
425	9.99E-03	530	5.75E-02	635	5.51E-02	740	3.64E-03
430	1.79E-02	535	5.93E-02	640	5.08E-02	745	3.14E-03
435	3.04E-02	540	6.11E-02	645	4.65E-02	750	2.70E-03
440	5.01E-02	545	6.31E-02	650	4.23E-02	755	2.32E-03
445	7.70E-02	550	6.49E-02	655	3.81E-02	760	1.98E-03
450	8.69E-02	555	6.69E-02	660	3.42E-02	765	1.70E-03
455	6.58E-02	560	6.88E-02	665	3.04E-02	770	1.46E-03
460	4.60E-02	565	7.10E-02	670	2.70E-02	775	1.26E-03
465	3.53E-02	570	7.30E-02	675	2.38E-02	780	1.08E-03
470	2.57E-02	575	7.47E-02	680	2.10E-02		
475	2.01E-02	580	7.61E-02	685	1.84E-02		
480	1.89E-02	585	7.73E-02	690	1.60E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3795, 0.3768)

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

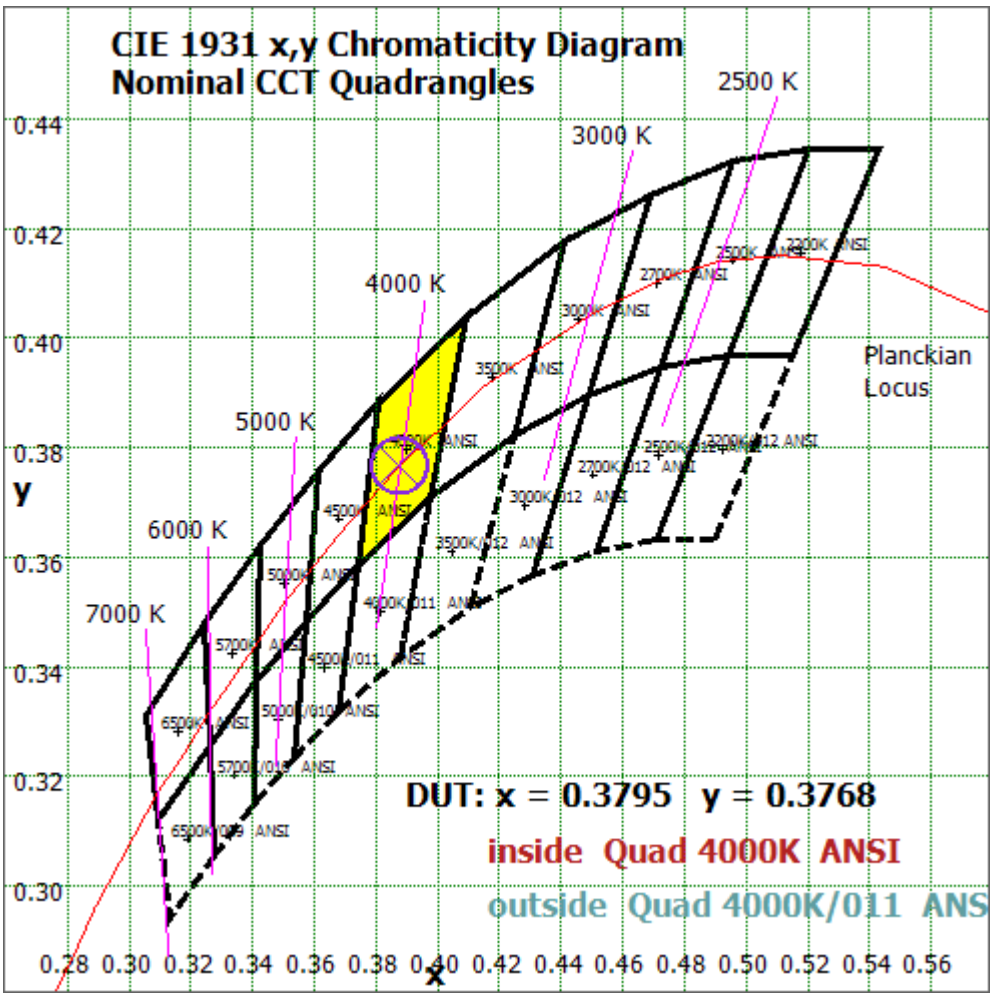
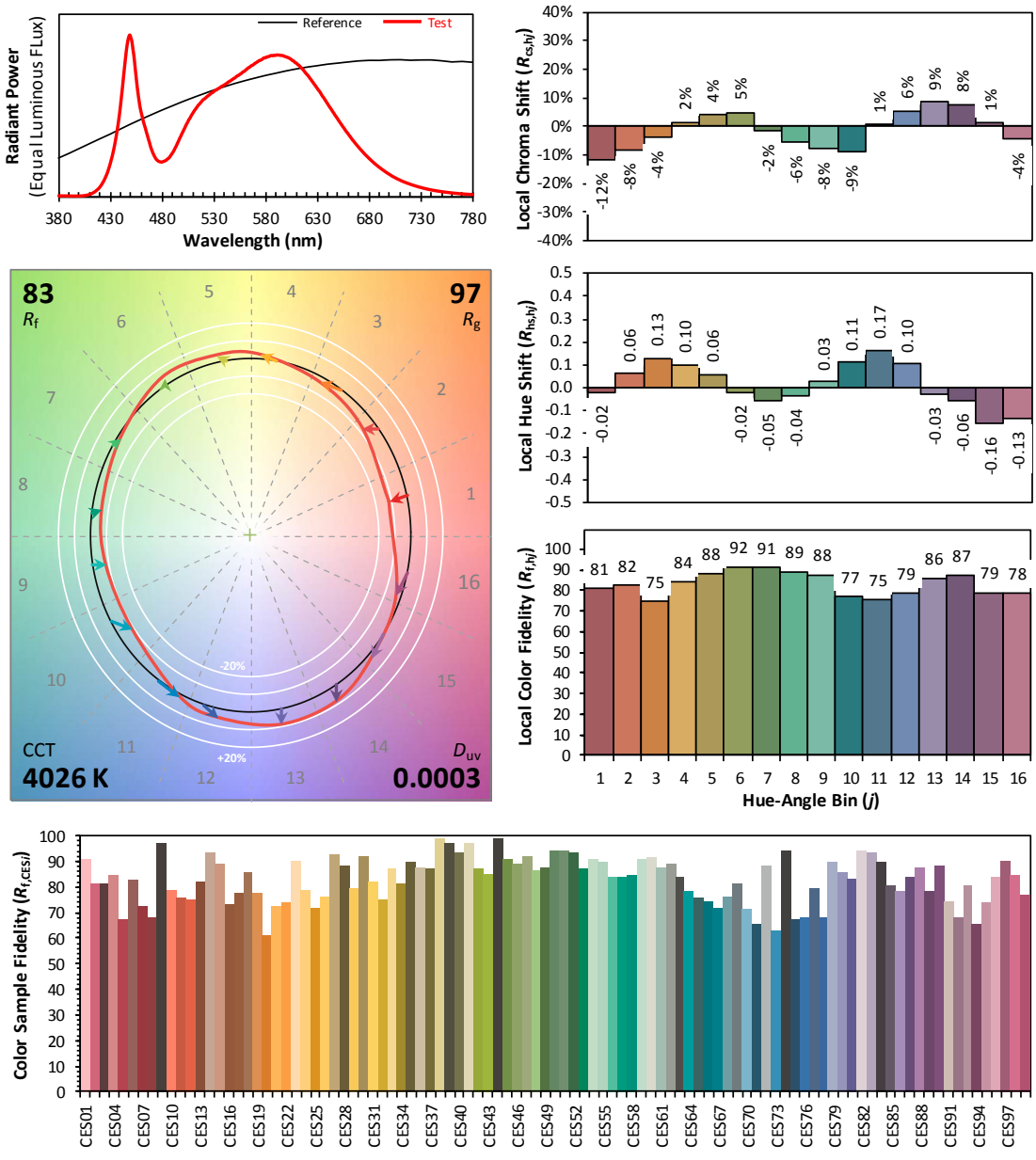


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.3795
y	0.3768
u'	0.2245
v'	0.5015

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	142.102	3.09%
10- 20	405.768	8.83%
20- 30	627.394	13.65%
30- 40	790.856	17.21%
40- 50	815.589	17.75%
50- 60	712.518	15.51%
60- 70	486.113	10.58%
70- 80	211.902	4.61%
80- 90	54.787	1.19%
90-100	24.912	0.54%
100-110	23.076	0.50%
110-120	38.999	0.85%
120-130	55.548	1.21%
130-140	63.091	1.37%
140-150	61.544	1.34%
150-160	48.146	1.05%
160-170	26.87	0.58%
170-180	5.776	0.13%
Total	4595.0	100%

γ(°)	Lumens	% Total
0- 60	3494.227	76.04%
60- 90	752.802	16.38%
0-90	4247.029	92.43%
90- 180	347.962	7.57%
0- 180	4595.0	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

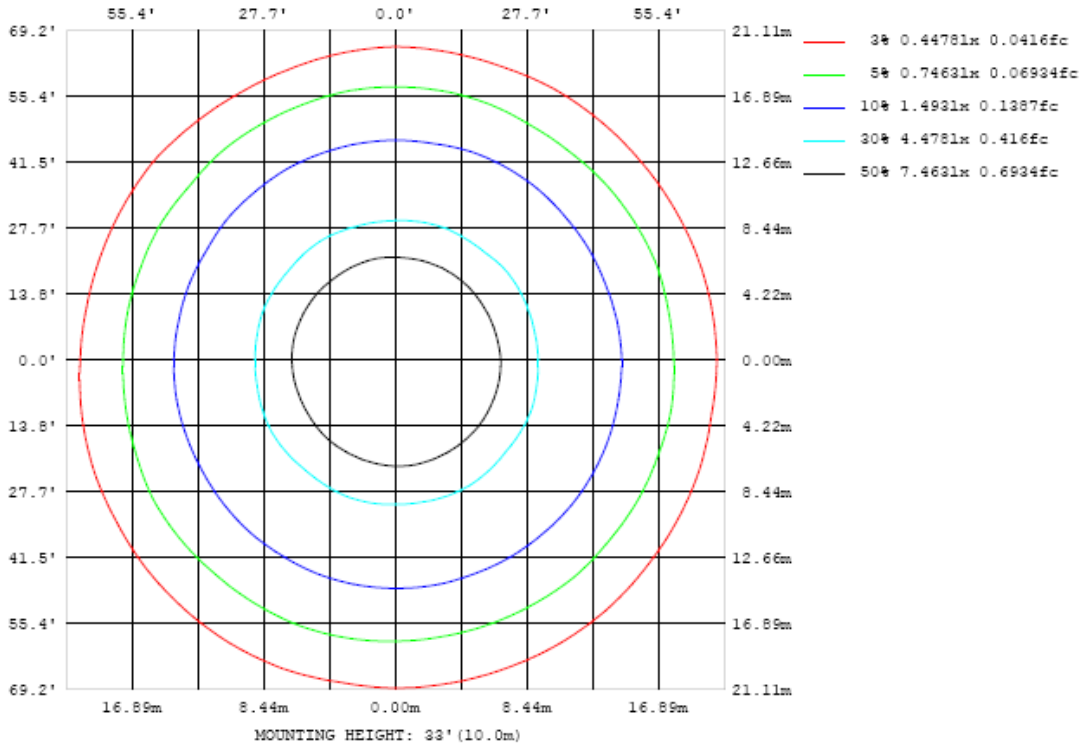


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

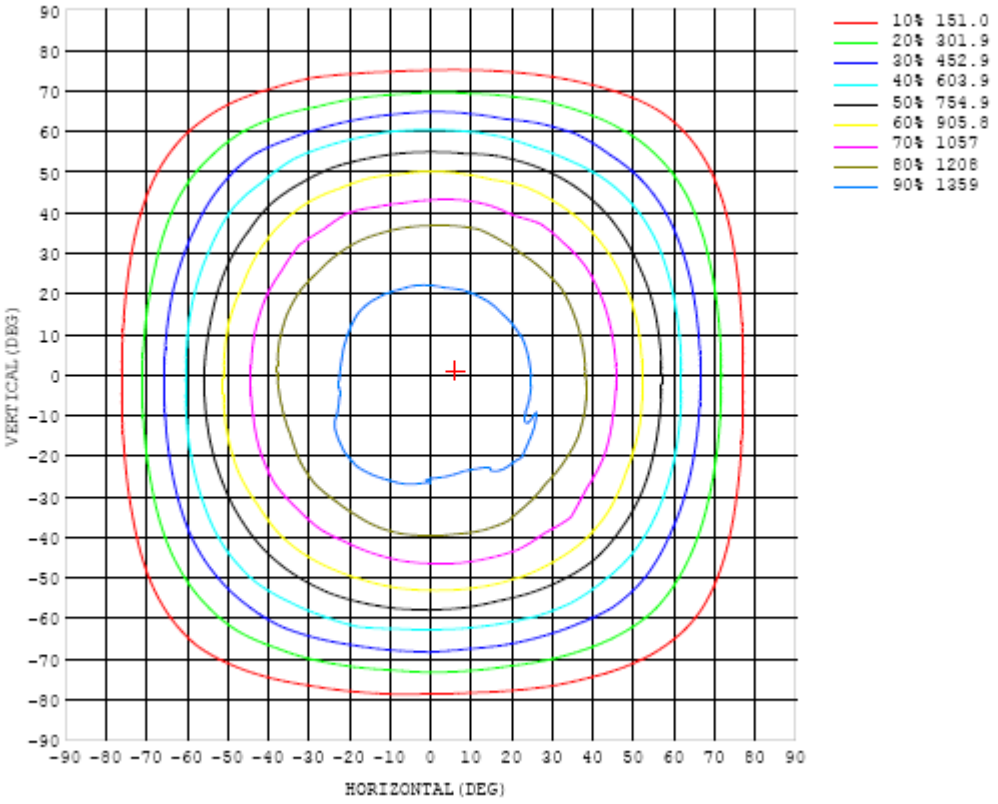


Chart 6: Isocandela Plot

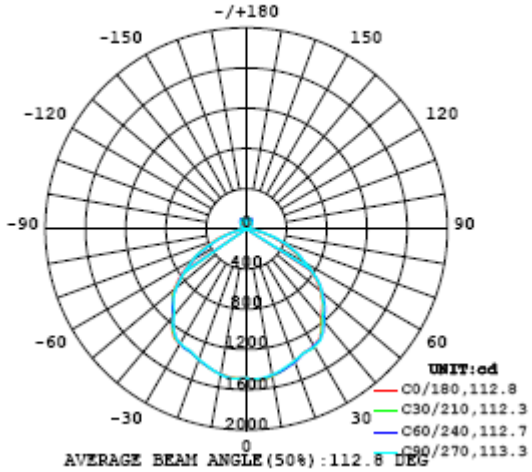


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ \ C (DEG) (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485
5	1509	1507	1507	1506	1506	1503	1501	1499	1497	1493	1492	1489	1487	1485	1485	1485	1487	1488	1487
10	1487	1487	1486	1484	1482	1479	1478	1474	1474	1472	1469	1468	1468	1469	1470	1470	1470	1468	1467
15	1447	1446	1448	1449	1449	1450	1450	1446	1440	1434	1429	1430	1433	1437	1441	1440	1438	1435	1430
20	1400	1400	1402	1404	1411	1413	1411	1407	1403	1398	1393	1396	1402	1406	1407	1404	1395	1390	1386
25	1357	1358	1358	1360	1365	1367	1362	1359	1360	1360	1363	1367	1371	1375	1375	1369	1356	1343	1335
30	1340	1347	1344	1350	1358	1351	1338	1342	1348	1350	1344	1341	1346	1348	1342	1332	1329	1331	1325
35	1281	1290	1293	1296	1294	1301	1298	1305	1314	1306	1287	1281	1276	1274	1267	1258	1262	1265	1273
40	1158	1174	1180	1171	1159	1182	1212	1209	1199	1199	1200	1199	1182	1165	1173	1174	1153	1142	1144
45	1069	1073	1091	1086	1095	1093	1105	1100	1091	1092	1088	1080	1066	1067	1063	1072	1065	1051	1045
50	962	974	967	978	1001	987	984	995	991	980	974	956	963	965	951	948	962	948	936
55	827	828	834	843	846	842	849	846	851	848	848	842	828	823	810	795	792	792	785
60	651	673	667	669	670	674	668	665	674	682	691	690	683	674	673	668	642	628	617
65	504	496	513	527	540	540	545	549	548	553	547	552	553	547	527	516	510	492	482
70	355	350	349	365	365	376	377	386	398	398	393	380	378	377	365	348	355	337	330
75	191	206	210	213	221	217	226	240	241	247	244	229	226	225	216	212	200	187	175
80	92.3	96.4	104	108	107	110	115	115	120	124	123	127	121	114	114	98.9	96.0	86.9	81.1
85	45.9	50.3	51.2	52.4	52.7	54.4	55.9	54.5	55.8	56.6	56.2	55.9	55.0	52.4	51.2	48.1	45.8	43.3	41.2
90	27.5	28.3	28.4	28.3	28.0	29.2	29.6	30.0	30.5	30.8	30.2	29.3	28.5	27.0	27.7	27.1	26.0	25.8	25.8
95	23.8	23.1	22.7	23.0	23.4	23.2	24.1	24.7	24.4	24.6	24.4	23.9	23.6	23.0	22.8	22.3	22.2	22.1	21.8
100	18.3	18.8	18.8	17.7	17.2	18.0	18.5	18.4	18.0	17.8	17.8	17.4	16.6	16.4	17.4	17.4	17.7	16.3	16.7
105	20.6	21.3	21.4	20.0	19.3	19.2	18.7	18.6	17.8	18.1	18.8	17.6	17.7	18.1	18.7	19.4	19.2	18.5	19.9
110	27.6	28.7	30.2	30.2	29.3	29.3	29.1	27.0	27.6	28.1	27.9	27.5	26.8	26.1	25.8	26.3	27.0	27.4	28.4
115	39.5	37.3	36.8	37.6	37.0	34.6	33.0	33.4	34.7	35.1	34.3	33.6	35.1	35.6	35.4	35.5	37.4	40.2	40.4
120	50.4	48.7	48.1	49.0	48.8	46.8	46.0	45.9	48.2	47.8	46.2	45.6	47.1	49.8	48.8	49.0	50.0	51.8	51.8
125	60.7	60.1	59.4	59.1	59.3	58.5	59.4	58.4	60.1	60.2	59.2	59.9	59.7	61.4	60.8	62.3	61.9	62.5	62.6
130	70.9	73.8	72.6	69.2	69.3	68.2	71.6	70.0	69.6	70.1	72.0	73.5	70.5	71.4	70.8	74.6	73.2	72.8	72.9
135	78.2	84.2	83.9	77.3	77.6	76.9	82.6	79.8	77.4	77.7	83.0	84.9	79.0	78.9	78.3	85.2	83.4	79.6	80.0
140	86.2	95.0	94.8	85.3	84.9	84.6	92.7	88.7	84.8	84.9	91.4	94.4	86.3	86.2	86.5	96.0	94.3	87.3	87.4
145	93.1	105	104	92.5	92.2	92.6	103	97.9	92.1	92.1	100.0	104	93.7	93.0	93.6	106	104	94.2	94.1
150	99.3	113	112	98.5	98.2	99.3	112	106	98.5	98.5	107	112	100.0	99.1	99.9	114	113	99.8	100
155	104	109	104	103	103	104	118	105	104	104	105	118	105	105	105	106	106	89.7	103
160	108	93.5	107	107	107	108	94.3	108	108	108	109	94.8	109	108	108	108	93.5	76.8	80.1
165	96.3	94.6	98.5	110	110	97.2	95.2	104	111	112	109	96.0	97.6	111	95.0	84.5	76.5	74.8	74.6
170	93.9	94.3	94.2	87.2	88.2	94.8	94.9	94.7	93.0	78.8	79.7	94.1	80.4	62.3	74.1	77.9	47.7	27.5	48.5
175	60.1	60.1	70.2	75.6	75.5	65.5	60.1	60.2	59.2	58.3	42.3	30.8	35.5	38.8	40.2	38.6	37.1	39.2	51.7
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 6: Luminous Intensity Data

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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	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485	1485		
5	1488	1490	1492	1493	1493	1494	1494	1496	1497	1499	1501	1501	1503	1505	1505	1508	1509		
10	1464	1465	1469	1471	1472	1470	1470	1473	1475	1476	1476	1476	1477	1479	1482	1485	1487		
15	1429	1429	1431	1435	1433	1429	1426	1424	1426	1428	1432	1435	1434	1434	1435	1439	1446		
20	1383	1386	1391	1395	1393	1386	1380	1382	1380	1378	1380	1385	1385	1388	1393	1397	1402		
25	1336	1338	1344	1348	1348	1343	1340	1335	1332	1333	1336	1336	1337	1340	1350	1354	1355		
30	1320	1312	1317	1319	1315	1318	1323	1325	1313	1308	1302	1306	1307	1309	1312	1323	1331		
35	1279	1274	1263	1251	1245	1249	1254	1255	1252	1253	1257	1252	1250	1250	1255	1258	1271		
40	1144	1150	1137	1111	1131	1134	1116	1115	1117	1125	1136	1118	1108	1141	1154	1152	1152		
45	1045	1042	1032	1046	1021	1031	1018	1009	1024	1025	1026	1024	1054	1053	1065	1065	1066		
50	936	913	922	923	920	906	913	904	910	907	902	924	926	934	938	955	967		
55	767	761	747	757	750	756	751	753	754	754	776	780	784	780	789	792	811		
60	615	606	610	594	608	606	608	620	617	619	613	598	604	624	638	650	648		
65	464	442	445	454	432	431	433	433	450	446	437	462	470	461	473	483	496		
70	315	308	298	296	285	273	283	281	292	292	298	309	306	314	327	330	347		
75	170	162	156	155	153	160	154	151	153	159	164	164	167	173	185	186	195		
80	75.6	72.9	71.1	71.1	70.9	70.3	69.9	68.3	68.0	69.5	73.9	77.2	81.4	84.5	85.5	89.0	89.7		
85	39.9	38.6	37.5	35.7	37.0	37.2	36.6	36.8	37.6	39.1	40.4	41.2	41.6	44.0	46.1	45.5	45.3		
90	25.7	25.1	25.1	25.4	26.2	27.2	27.3	27.6	27.8	28.8	29.3	29.5	29.3	29.2	29.8	29.6	28.4		
95	20.5	20.1	20.3	20.2	20.7	21.1	21.9	22.3	23.3	23.0	23.5	24.0	23.9	24.3	23.9	24.4	24.6		
100	17.2	17.0	17.2	16.3	17.2	17.1	17.6	17.3	17.9	17.6	18.7	18.7	18.2	19.0	18.8	19.4	18.0		
105	21.6	21.3	21.4	21.1	22.6	24.0	22.8	22.6	23.4	25.5	25.1	23.4	22.4	22.9	24.8	23.0	20.9		
110	29.2	29.8	30.3	31.2	31.3	31.2	31.9	32.5	31.7	32.4	32.6	32.1	31.5	31.0	31.3	30.8	29.4		
115	39.4	41.0	43.0	44.5	43.2	42.5	42.9	45.4	44.5	42.4	42.2	44.1	43.9	41.5	40.2	39.9	40.8		
120	51.3	52.4	53.3	55.2	54.7	54.9	53.8	55.1	54.7	54.0	53.8	54.8	54.4	52.6	52.1	51.6	52.4		
125	63.6	64.0	63.3	65.0	64.9	67.3	64.1	64.9	64.6	66.7	65.5	64.5	64.4	62.8	64.1	62.4	62.6		
130	76.4	76.3	72.4	73.8	74.8	79.1	72.8	72.3	72.6	77.6	77.8	74.0	73.2	72.7	76.1	72.5	72.8		
135	86.3	86.9	80.6	81.3	82.4	89.7	81.6	81.0	81.1	88.4	88.5	81.0	80.7	81.3	86.6	79.3	78.8		
140	96.6	97.8	88.7	88.8	90.4	99.9	90.4	88.8	89.1	99.4	99.0	88.7	88.2	91.4	97.3	87.4	86.3		
145	105	107	95.9	95.6	97.3	109	97.9	96.0	96.1	108	108	95.4	94.8	101	107	94.3	93.0		
150	108	107	101	101	102	116	103	102	102	116	111	101	101	110	114	100	99.2		
155	104	100	103	90.9	106	102	107	106	106	103	106	105	105	106	106	106	105		
160	91.4	62.5	80.3	109	106	94.2	95.1	110	110	94.7	95.7	109	108	97.8	94.9	109	109		
165	67.7	78.8	62.3	92.2	93.5	79.1	92.2	108	111	95.5	95.1	101	110	95.2	95.2	100	111		
170	72.3	74.3	58.8	80.0	61.1	86.3	92.9	84.0	77.4	82.8	93.7	78.6	77.9	87.4	94.5	94.0	78.8		
175	52.5	44.5	47.8	24.6	47.5	42.2	41.0	41.3	46.6	56.9	57.2	57.4	54.2	58.1	58.9	69.5	71.9		
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	PF2010A	HZTE028-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	DPS1060	HZTE001-06	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	WY12010	HZTE004-03	Aug. 02, 2019	Aug. 01, 2020
Temperature recorder	JM624U	HZTE018-08	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 02, 2019	Aug. 01, 2020
Standard source	D908	HZTE012-01	Aug. 02, 2019	Aug. 01, 2020
Integrate Sphere system	3M	HZTE015-04	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	PCR 500L	HZTE001-07	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	IT6154	HZTE004-04	Aug. 02, 2019	Aug. 01, 2020
Standard source	SCL-1400	HZTE012-02	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 02, 2019	Aug. 01, 2020
Temperature Meter	TES1310	HZTE017-01	Aug. 02, 2019	Aug. 01, 2020

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 Low Bays) 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 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 Low Bays) 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

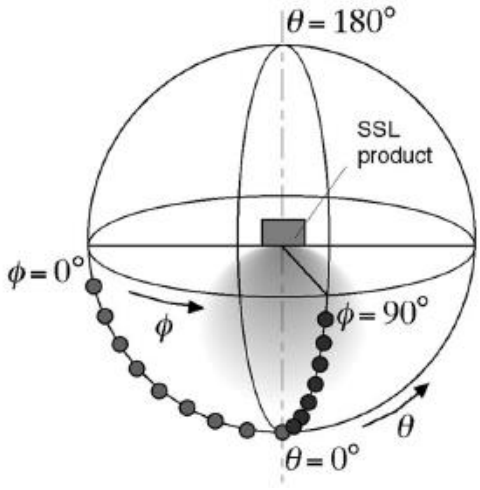
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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