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 High Bay

Model: 120HIDHB/850/BYP/EX39

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20050018b

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: **120HIDHB/850/BYP/EX39**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
153.3	18050.0	117.71	0.9855

CCT (K)	CRI	Stabilization Time (Light & Power)
5275	83.2	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

TABLE OF CONTENT

SAMPLE PHOTO

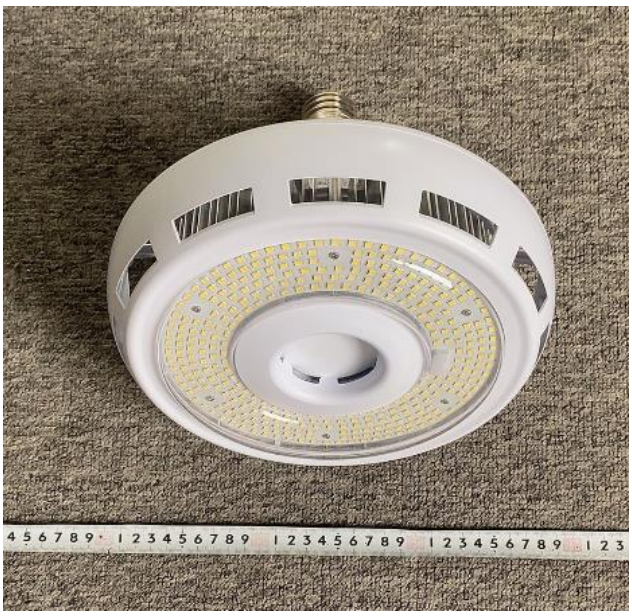


Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED High Bay
Model	: 120HIDHB/850/BYP/EX39
Electrical Ratings	: 100-277Vac, 50/60Hz, 120W
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 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)	0.995	0.452
Power Factor	0.9855	0.9352
Test Power (W)	117.71	117.08
THD A%	12.81	19.22
Luminous Efficacy (lm/W)	153.3	154.2
Total Luminous Flux (lm)	18050.0	18057.0
Color Rendering Index (CRI)	83.2	
R9	7.2	
Correlated Color Temperature (CCT)(K)	5275	
Chromaticity Chroma x	0.3379	
Chromaticity Chroma y	0.3503	
Chromaticity Chroma u	0.2071	
Chromaticity Chroma v	0.3220	
Duv	0.0023	
Chromaticity Chroma u ’	0.2071	
Chromaticity Chroma v’	0.4830	

Special Color Rendering Indices	
R1	81.4
R2	89
R3	93.1
R4	82.1
R5	81.9
R6	83.8
R7	86.9
R8	67.2
R9	7.2
R10	73.1
R11	81.1
R12	60.4
R13	83.7
R14	96.5

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)	1.000
Power Factor	0.9841
Power (W)	118.05
Luminous Efficacy (lm/W)	153.9
Total Luminous Flux (lm)	18170.0
Beam Angle (°)	111.4 (0^o-180^o) / 111.2 (90^o-270^o)
Center Beam Candle Power (cd)	6416
Maximum Beam Candle Power (cd)	6428 (At: C=70.0, Gamma=2.0)
Spacing Criteria	1.26 (0^o-180^o) / 1.24 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	79.87%
Zonal Lumens in the 60 °-90 °Zone	16.44%
Zonal Lumens in the 90 °-120 °Zone	0.99%
Zonal Lumens in the 120 °-180 °Zone	2.70%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

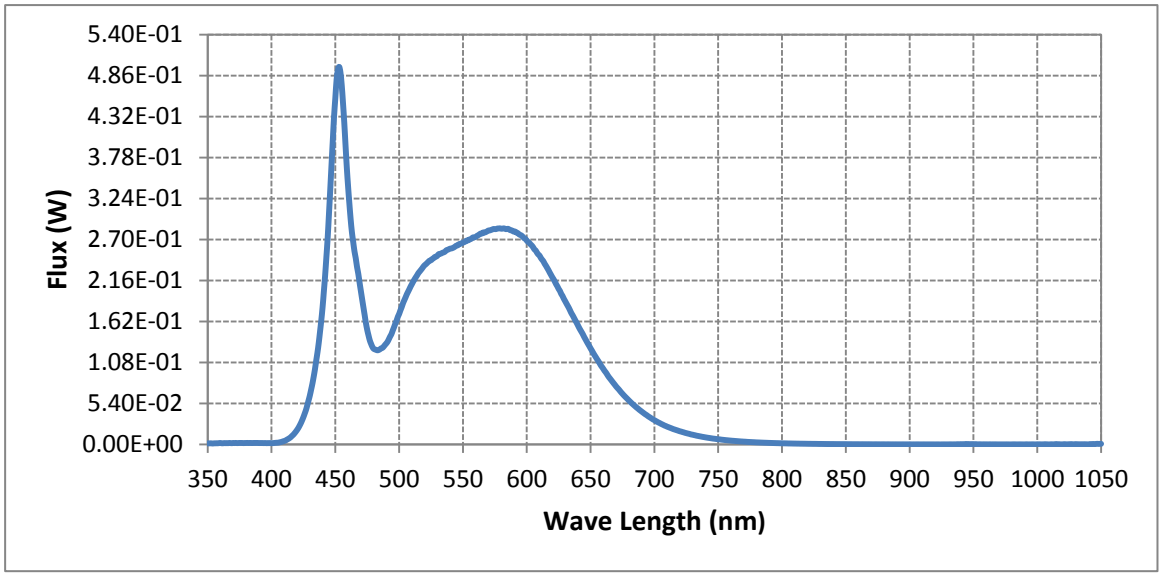
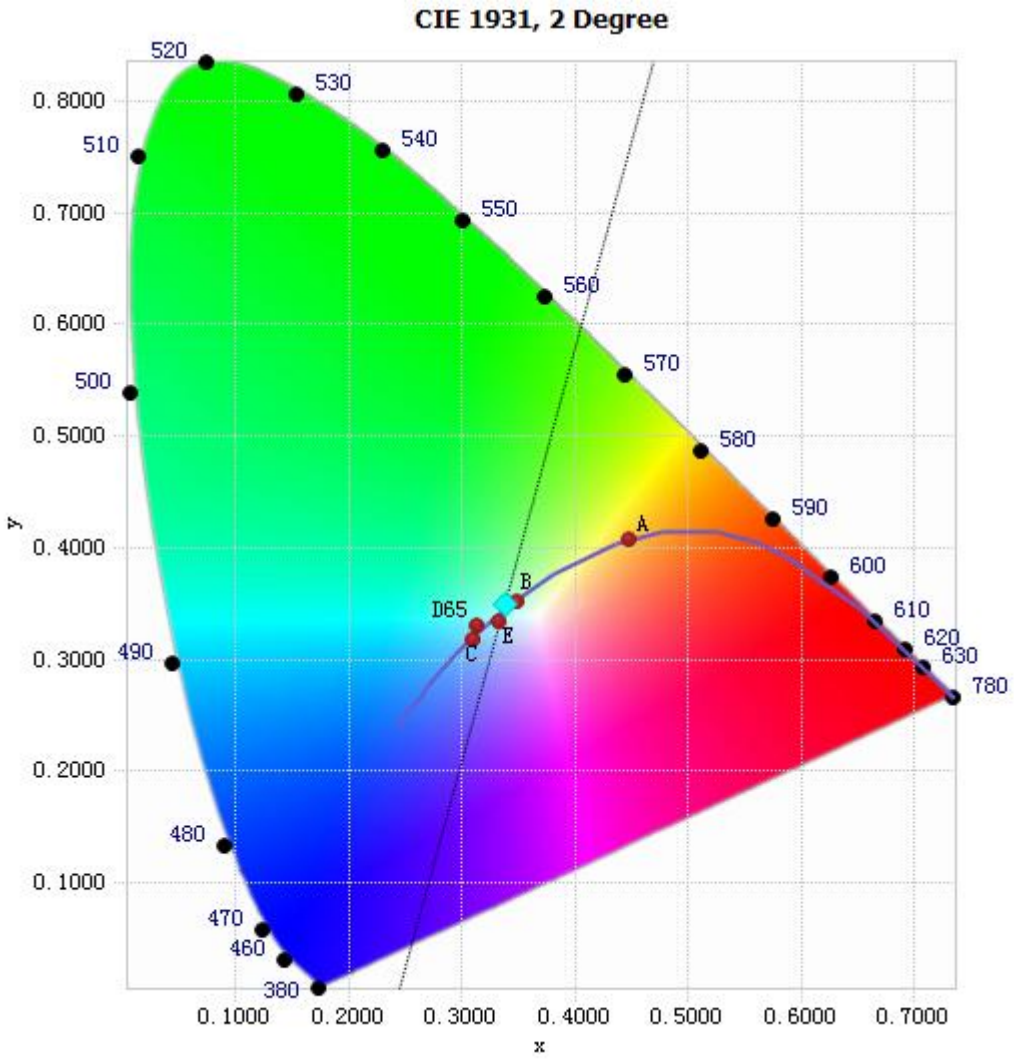


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.96E-03	485	1.25E-01	590	2.80E-01	695	3.73E-02
385	1.88E-03	490	1.33E-01	595	2.76E-01	700	3.21E-02
390	1.90E-03	495	1.50E-01	600	2.69E-01	705	2.74E-02
395	1.89E-03	500	1.72E-01	605	2.60E-01	710	2.35E-02
400	1.76E-03	505	1.94E-01	610	2.49E-01	715	2.02E-02
405	2.38E-03	510	2.11E-01	615	2.36E-01	720	1.74E-02
410	4.61E-03	515	2.26E-01	620	2.20E-01	725	1.50E-02
415	9.53E-03	520	2.36E-01	625	2.05E-01	730	1.29E-02
420	1.91E-02	525	2.43E-01	630	1.89E-01	735	1.10E-02
425	3.61E-02	530	2.49E-01	635	1.73E-01	740	9.40E-03
430	6.42E-02	535	2.53E-01	640	1.57E-01	745	8.03E-03
435	1.10E-01	540	2.58E-01	645	1.42E-01	750	6.88E-03
440	1.81E-01	545	2.62E-01	650	1.27E-01	755	5.91E-03
445	3.03E-01	550	2.66E-01	655	1.13E-01	760	5.08E-03
450	4.56E-01	555	2.70E-01	660	9.96E-02	765	4.39E-03
455	4.74E-01	560	2.74E-01	665	8.74E-02	770	3.75E-03
460	3.40E-01	565	2.78E-01	670	7.65E-02	775	3.24E-03
465	2.55E-01	570	2.82E-01	675	6.68E-02	780	2.79E-03
470	2.02E-01	575	2.84E-01	680	5.81E-02		
475	1.51E-01	580	2.84E-01	685	5.03E-02		
480	1.26E-01	585	2.84E-01	690	4.34E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3379, 0.3503)

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

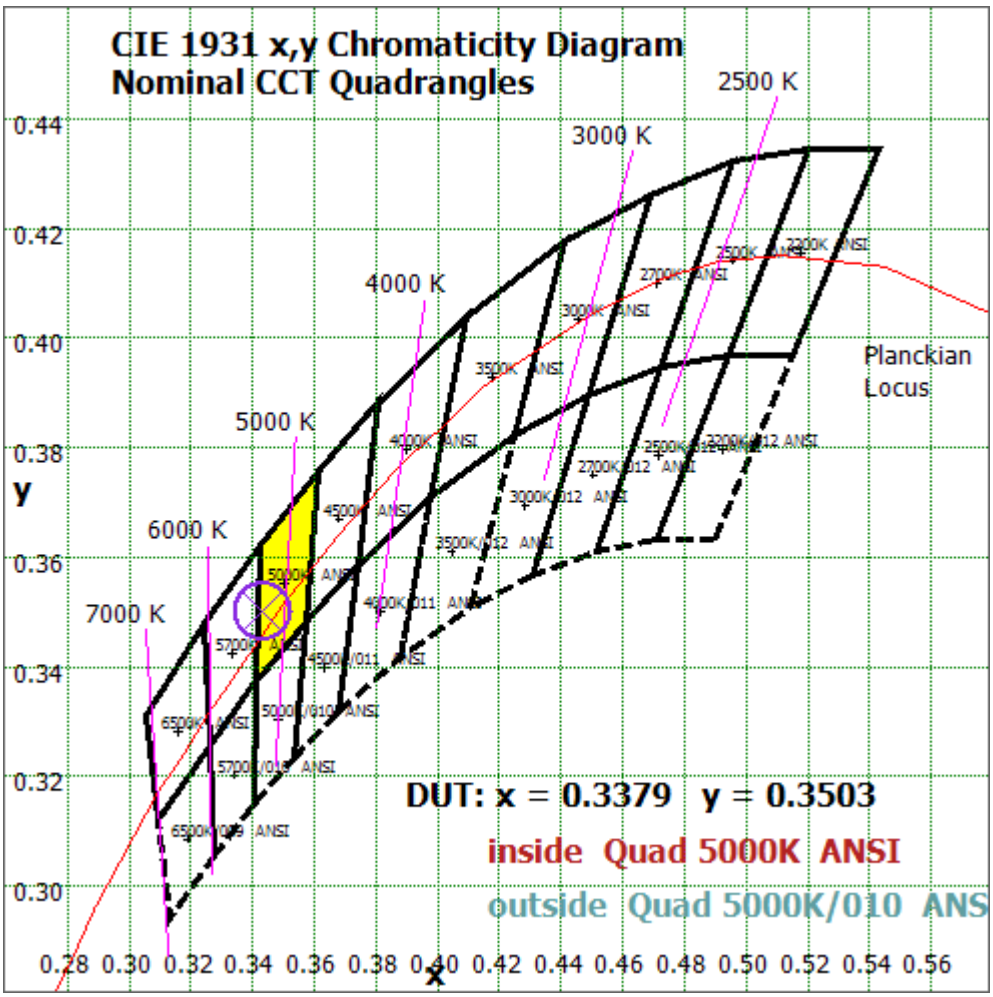
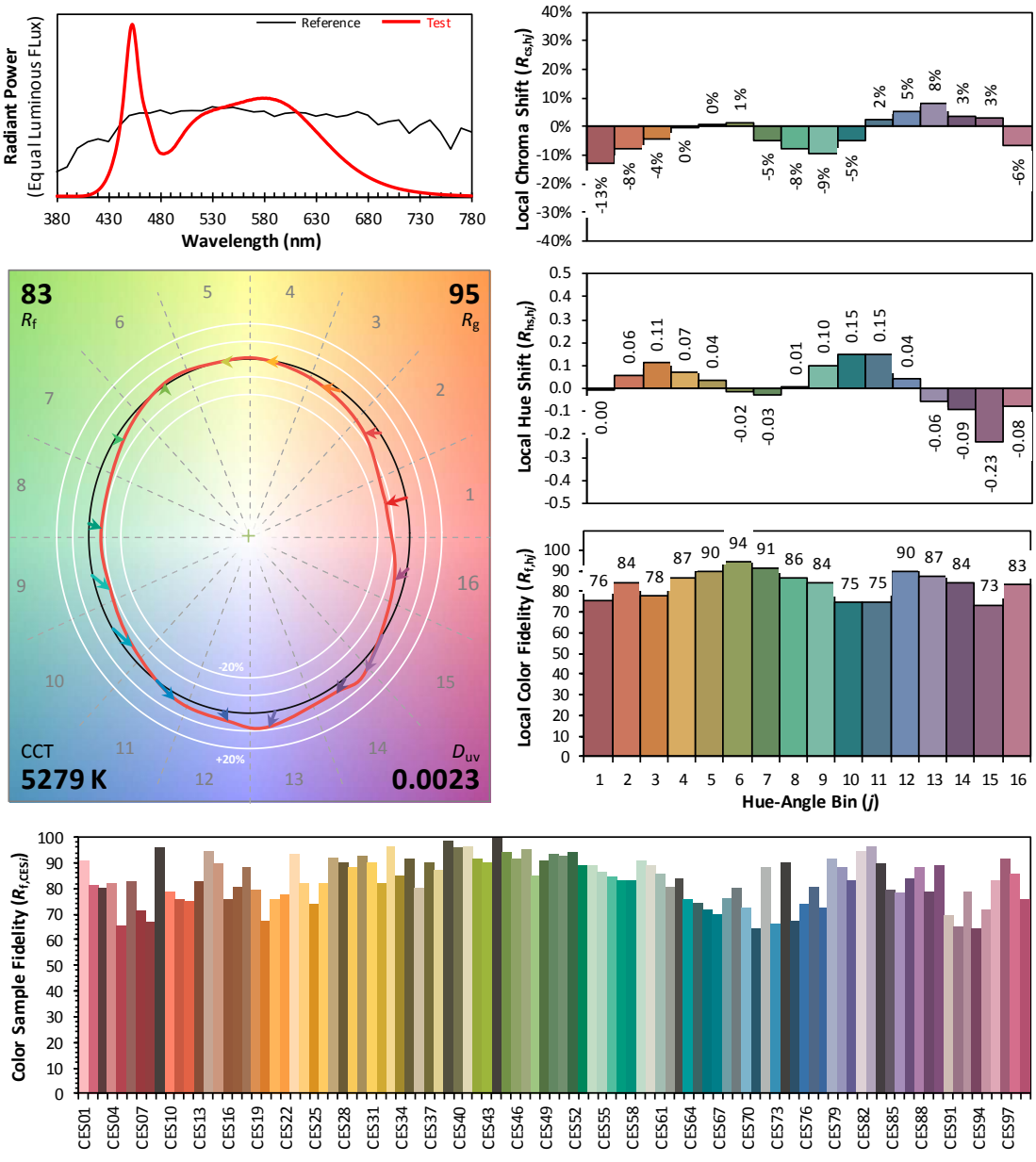


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.3379
y	0.3503
u'	0.2071
v'	0.4830

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	604.877	3.33%
10- 20	1736.986	9.56%
20- 30	2646.242	14.56%
30- 40	3211.104	17.67%
40- 50	3357.152	18.48%
50- 60	2955.448	16.27%
60- 70	1995.333	10.98%
70- 80	842.183	4.64%
80- 90	149.989	0.83%
90-100	42.113	0.23%
100-110	62.883	0.35%
110-120	74.711	0.41%
120-130	102.139	0.56%
130-140	115.037	0.63%
140-150	111.022	0.61%
150-160	91.967	0.51%
160-170	55.773	0.31%
170-180	14.857	0.08%
Total	18169.8	100%

γ(°)	Lumens	% Total
0- 60	14511.81	79.87%
60- 90	2987.505	16.44%
0-90	17499.31	96.31%
90- 180	670.502	3.69%
0- 180	18169.8	100%

Table 5: Zonal Lumen

Note: The Flux in this table might be a little different from the total flux in Table 2 due to rounding.

Illuminance Plots- Goniophotometer Method

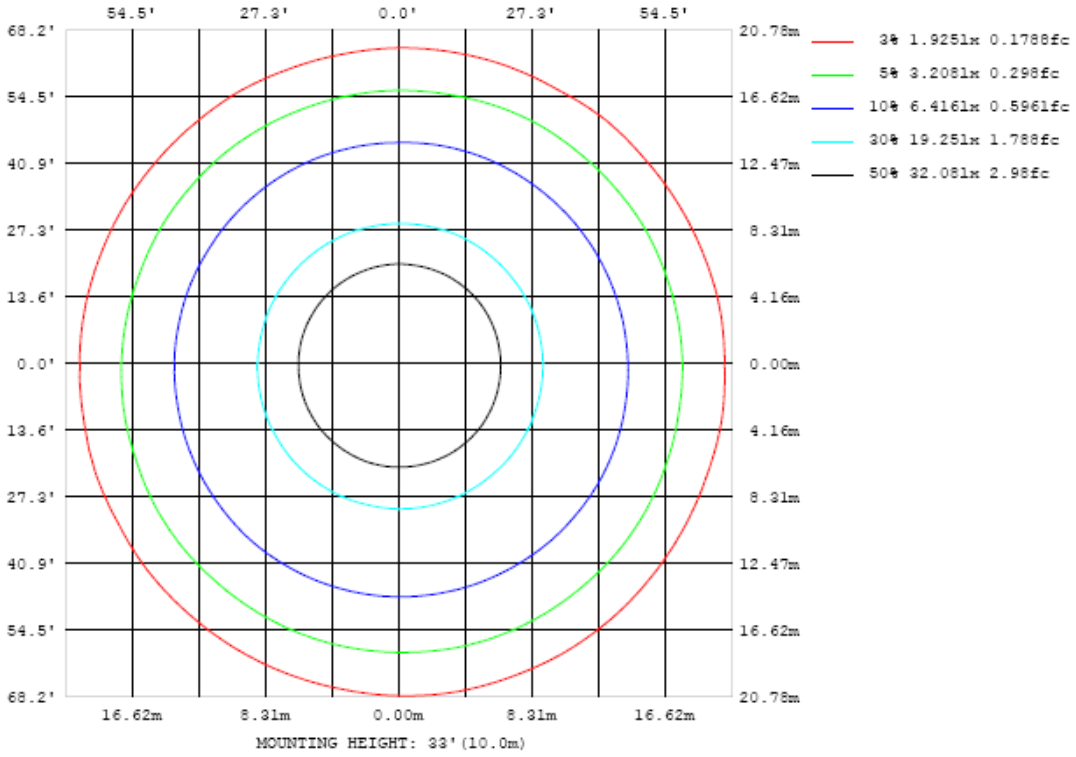


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

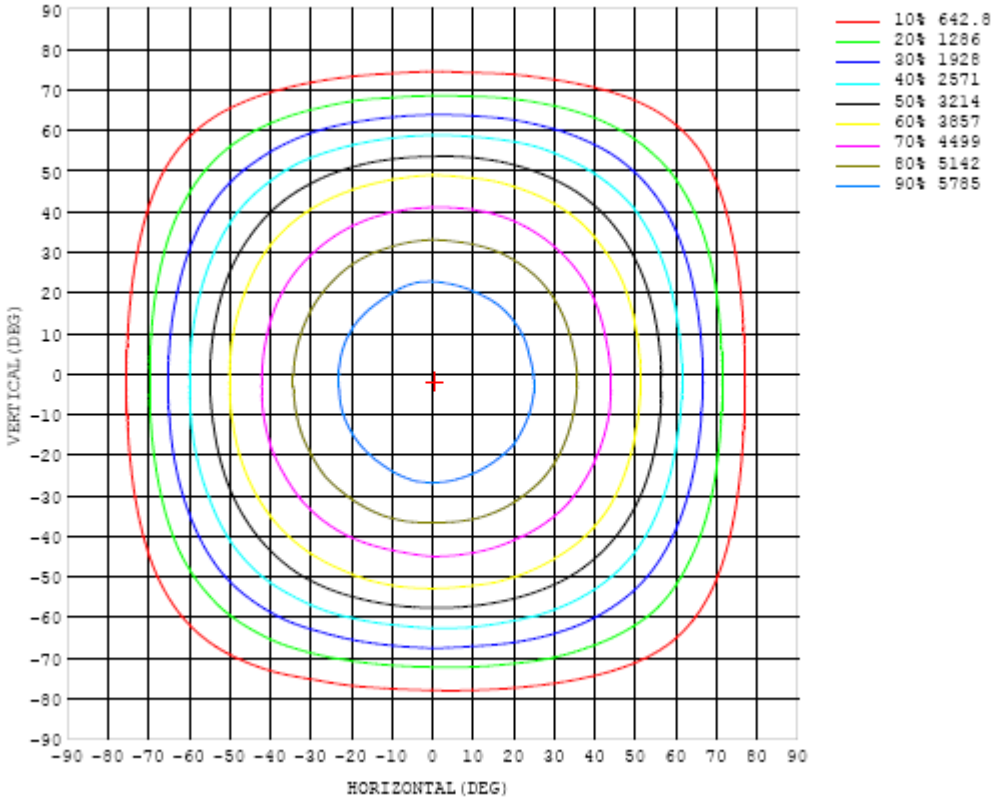


Chart 6: Isocandela Plot

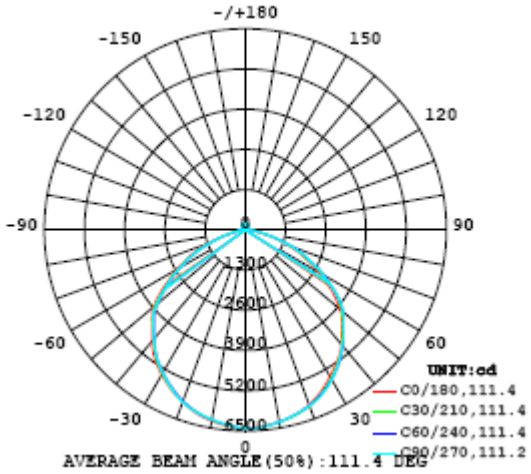


Chart 7: Polar Candela Distribution

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	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416
5	6369	6378	6384	6389	6393	6390	6399	6401	6402	6403	6400	6404	6404	6400	6395	6387	6385	6374	6372
10	6296	6307	6314	6312	6313	6307	6307	6309	6306	6308	6310	6317	6318	6320	6317	6308	6301	6282	6274
15	6186	6205	6212	6211	6210	6198	6192	6192	6189	6191	6192	6201	6201	6202	6199	6185	6173	6150	6139
20	6016	6043	6058	6058	6059	6051	6050	6056	6061	6063	6057	6047	6033	6025	6018	6001	5985	5957	5936
25	5772	5803	5819	5832	5848	5846	5848	5858	5869	5876	5871	5840	5808	5787	5770	5753	5729	5704	5692
30	5474	5492	5526	5548	5571	5573	5587	5589	5592	5605	5595	5570	5533	5511	5496	5480	5460	5426	5408
35	5180	5192	5210	5240	5263	5271	5279	5277	5267	5258	5269	5260	5239	5217	5208	5173	5151	5122	5098
40	4832	4829	4858	4884	4900	4889	4914	4925	4911	4898	4890	4890	4868	4842	4820	4784	4770	4735	4693
45	4413	4454	4459	4464	4487	4486	4486	4495	4498	4501	4458	4443	4445	4424	4404	4363	4347	4305	4262
50	4001	4023	4046	4080	4095	4110	4133	4131	4120	4126	4111	4102	4069	4033	3995	3961	3937	3896	3874
55	3395	3449	3512	3556	3574	3587	3585	3596	3593	3593	3567	3542	3506	3477	3404	3338	3287	3223	3202
60	2748	2766	2818	2857	2893	2914	2931	2947	2943	2901	2913	2877	2836	2789	2770	2724	2652	2622	2572
65	2078	2114	2126	2151	2203	2215	2247	2257	2263	2242	2207	2173	2156	2133	2116	2073	2055	2028	1967
70	1507	1528	1546	1594	1636	1641	1665	1674	1679	1650	1645	1600	1557	1501	1449	1402	1358	1299	1262
75	861	883	921	931	972	998	1008	1013	974	967	942	939	889	895	829	789	752	723	689
80	373	393	407	440	447	455	466	464	465	449	441	420	403	375	355	331	307	280	261
85	121	131	137	142	149	153	155	156	151	146	140	132	125	125	121	116	114	107	103
90	57.4	62.5	63.5	68.7	67.4	70.3	68.8	71.7	69.1	69.2	65.9	64.1	59.6	60.8	59.5	60.4	56.0	53.0	50.8
95	32.2	33.7	33.5	35.5	35.7	36.4	36.3	37.1	37.2	37.4	35.7	35.3	32.9	33.5	33.5	33.9	34.3	33.9	33.6
100	39.8	37.5	36.3	33.8	33.9	32.6	32.4	33.2	33.5	32.8	35.5	35.3	35.5	37.8	38.6	39.6	42.8	42.1	45.2
105	66.7	62.4	62.0	62.4	59.5	61.5	59.8	58.3	56.9	63.1	65.1	67.5	72.0	71.4	72.8	76.6	72.0	70.3	73.0
110	62.8	56.8	56.4	60.4	56.1	56.7	60.2	56.1	56.5	61.3	57.6	58.0	63.5	59.1	58.8	64.0	60.9	59.3	66.1
115	73.4	72.7	71.2	70.8	70.4	69.7	71.7	69.1	68.8	71.1	71.1	71.1	73.2	72.5	72.7	74.6	73.1	75.0	76.5
120	93.8	92.2	91.5	91.4	90.7	89.7	88.8	89.1	89.0	89.8	89.9	90.4	91.1	90.8	92.4	94.0	93.7	93.8	95.1
125	112	110	110	113	111	111	114	110	111	113	110	111	114	113	113	118	116	115	119
130	132	126	127	132	128	128	133	127	128	132	129	128	134	130	129	136	133	134	141
135	151	143	144	152	144	144	152	144	144	151	144	144	152	146	146	155	148	148	158
140	167	157	157	167	157	157	169	158	158	169	160	159	169	160	161	172	163	161	173
145	183	169	169	182	169	169	183	170	169	183	171	171	185	173	172	186	176	174	189
150	196	181	181	196	181	181	196	181	181	196	184	182	197	187	184	199	191	185	203
155	209	192	192	208	192	191	208	192	192	209	196	193	209	203	194	209	190	194	214
160	218	202	202	218	203	201	219	205	201	219	215	202	218	219	203	187	184	196	197
165	205	204	205	220	205	205	216	206	206	221	207	206	206	187	176	184	181	184	182
170	187	205	190	187	205	204	187	191	186	172	187	204	189	168	148	147	146	107	111
175	182	199	182	182	197	175	151	143	172	162	163	161	154	140	140	129	119	86.3	106
180	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7

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	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416	6416		
5	6367	6359	6352	6347	6340	6339	6337	6334	6333	6330	6336	6339	6340	6346	6347	6355	6355		
10	6262	6249	6236	6234	6228	6233	6228	6226	6223	6219	6226	6228	6236	6244	6253	6268	6277		
15	6121	6106	6095	6089	6087	6092	6102	6104	6101	6091	6094	6094	6103	6108	6117	6143	6158		
20	5923	5917	5906	5900	5889	5895	5918	5931	5929	5918	5911	5913	5922	5934	5950	5973	5989		
25	5681	5677	5657	5637	5625	5619	5637	5650	5648	5642	5647	5658	5685	5710	5723	5736	5743		
30	5407	5392	5362	5351	5342	5326	5324	5333	5341	5329	5348	5369	5393	5414	5437	5441	5450		
35	5070	5043	5024	5002	5002	4999	4980	4990	5000	5007	5030	5060	5077	5106	5123	5135	5146		
40	4662	4639	4612	4580	4575	4573	4566	4573	4586	4601	4636	4654	4671	4705	4740	4781	4806		
45	4241	4248	4236	4212	4191	4177	4184	4188	4217	4233	4253	4260	4280	4296	4319	4349	4357		
50	3840	3799	3793	3748	3719	3688	3687	3699	3728	3717	3770	3791	3842	3880	3902	3951	3969		
55	3162	3138	3083	3063	3054	3047	3041	3032	3035	3060	3092	3117	3153	3190	3241	3291	3346		
60	2515	2455	2444	2415	2409	2391	2378	2377	2396	2409	2468	2523	2535	2585	2647	2671	2713		
65	1896	1820	1795	1772	1780	1786	1779	1768	1764	1773	1831	1854	1887	1954	1983	2024	2075		
70	1209	1182	1140	1168	1133	1136	1125	1139	1113	1131	1172	1212	1231	1257	1291	1355	1431		
75	657	643	611	585	581	569	562	580	593	590	627	631	659	706	752	813	826		
80	242	222	219	212	206	201	202	202	206	212	221	228	248	274	296	325	354		
85	99.0	94.0	87.9	85.5	83.6	80.2	82.5	83.3	84.9	82.8	84.2	82.5	90.8	97.0	105	112	120		
90	48.9	48.7	47.5	46.5	45.0	42.4	42.1	44.1	44.1	43.5	44.0	41.4	43.5	46.2	51.1	54.7	58.7		
95	33.6	33.3	32.3	32.6	32.3	31.9	32.4	32.2	31.4	30.9	30.6	30.9	31.5	32.3	31.9	33.2	32.1		
100	44.7	47.7	47.9	46.3	51.6	56.2	51.8	50.6	53.5	50.6	50.7	52.0	46.4	44.4	43.6	42.6	42.1		
105	73.2	70.3	67.8	65.2	64.3	65.6	60.6	60.3	64.0	63.3	59.4	60.5	60.0	64.2	64.4	61.9	65.8		
110	62.7	64.8	66.5	63.7	66.0	68.2	65.8	63.7	66.0	63.1	62.8	65.6	62.3	61.1	63.0	58.5	59.5		
115	75.5	75.9	77.9	78.6	78.8	79.4	78.4	79.0	78.8	75.7	75.3	77.7	76.0	75.7	77.0	75.0	72.5		
120	95.7	97.0	100	98.8	99.6	103	101	99.1	99.3	96.5	96.1	96.1	94.2	95.2	95.1	92.7	92.7		
125	116	117	120	118	119	121	117	117	120	117	117	119	115	115	115	111	111		
130	135	136	141	135	135	139	134	134	140	134	134	141	133	132	134	128	128		
135	150	150	158	150	151	158	151	150	157	149	149	156	146	147	153	144	145		
140	163	162	174	163	163	173	162	162	173	162	162	173	161	161	170	159	158		
145	176	176	190	177	177	189	175	176	189	176	176	189	175	174	186	172	172		
150	188	188	187	189	189	203	187	188	203	188	187	202	185	186	200	184	184		
155	200	196	197	182	198	216	198	199	215	198	198	214	196	198	212	195	195		
160	201	203	184	204	204	222	205	209	223	208	214	223	204	214	221	203	209		
165	141	153	159	196	189	207	204	191	189	208	208	198	207	207	201	207	206		
170	111	166	184	138	177	173	153	185	170	170	187	188	190	200	187	201	198		
175	106	144	164	136	145	176	167	165	153	153	154	168	160	158	156	178	162		
180	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7		

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 High 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 High 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

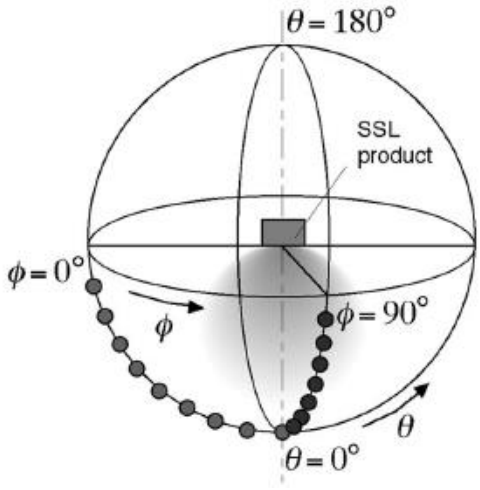
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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