LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

LED Highbay

Model: 135HIDHB/840/BYP/EX39

135HIDHBSEN/840/BYP/EX39

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20010030a

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

Review by: April Zou

Engineer: April Zou
Feb. 21, 2020

Approved by: Jim Zhang

Manager: Jim Zhang
Feb. 21, 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: **135HIDHB/840/BYP/EX39**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
148.7	20339.0	136.74	0.9986

CCT (K)	CRI	Stabilization Time (Light & Power)
3925	81.9	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 : Jan. 20, 2020

Date of Test : Feb. 21, 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 Highbay
Model	: 135HIDHB/840/BYP/EX39
Electrical Ratings	: 120-277V, 50/60Hz, 135W
Product Description	: Highbay 20000lm no sensor 4000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

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	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	1.141	0.508
Power Factor	0.9986	0.9434
Test Power (W)	136.74	132.78
THD A%	4.40	8.38
Luminous Efficacy (lm/W)	148.7	153.2
Total Luminous Flux (lm)	20339.0	20342.0
Color Rendering Index (CRI)	81.9	
R9	6.9	
Correlated Color Temperature (CCT)(K)	3925	
Chromaticity Chroma x	0.3850	
Chromaticity Chroma y	0.3835	
Chromaticity Chroma u	0.2255	
Chromaticity Chroma v	0.3368	
Duv	0.0018	
Chromaticity Chroma u ’	0.2255	
Chromaticity Chroma v’	0.5052	

Special Color Rendering Indices	
R1	80.1
R2	87.8
R3	93.6
R4	80.9
R5	79.7
R6	82.8
R7	86.5
R8	64.2
R9	6.9
R10	70.7
R11	79.2
R12	57.2
R13	81.9
R14	96.4

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 24.8 ℃.

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)	1.150
Power Factor	0.9985
Power (W)	137.96
Luminous Efficacy (lm/W)	149.3
Total Luminous Flux (lm)	20598.0
Beam Angle (°)	109.4 (0^o-180^o) / 190.8 (90^o-270^o)
Center Beam Candle Power (cd)	7827
Maximum Beam Candle Power (cd)	7829 (At: C=320.0, Gamma=0.5)
Spacing Criteria	1.25 (0^o-180^o) / 1.25 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	83.48%
Zonal Lumens in the 60 °-90 °Zone	14.29%
Zonal Lumens in the 90 °-120 °Zone	0.65%
Zonal Lumens in the 120 °-180 °Zone	1.58%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

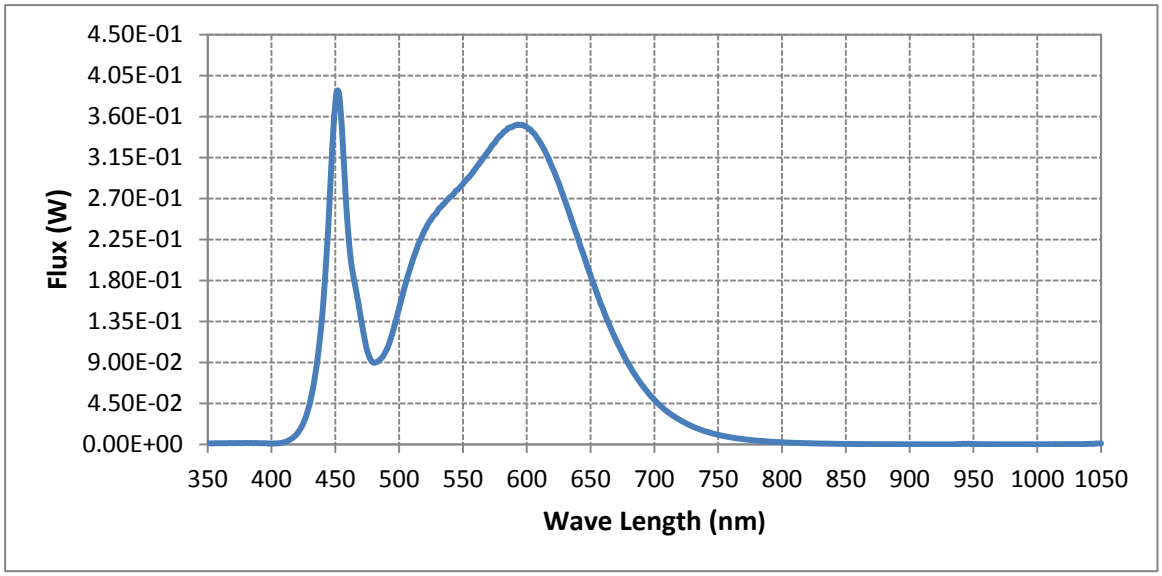
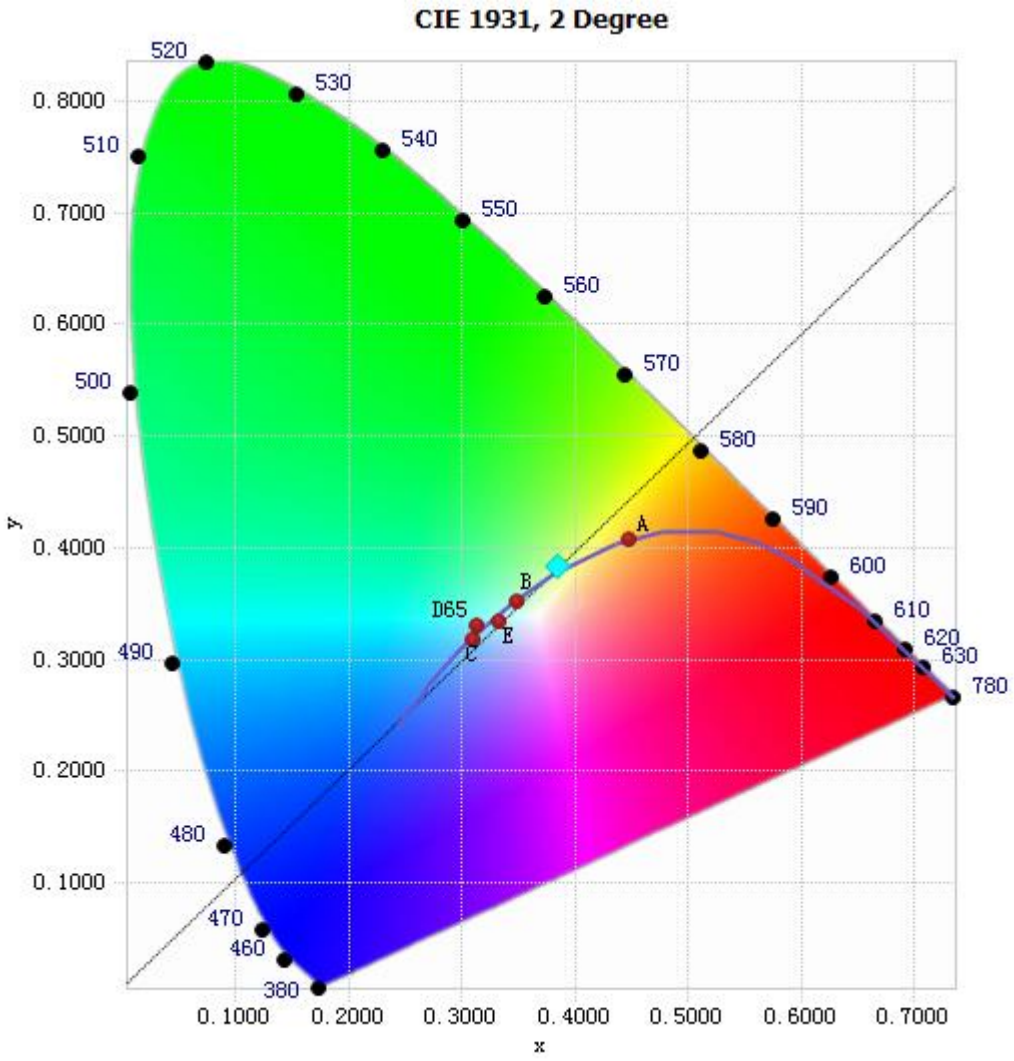


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.58E-03	485	9.31E-02	590	3.50E-01	695	5.70E-02
385	1.51E-03	490	1.04E-01	595	3.51E-01	700	4.91E-02
390	1.45E-03	495	1.23E-01	600	3.48E-01	705	4.21E-02
395	1.29E-03	500	1.50E-01	605	3.42E-01	710	3.61E-02
400	1.05E-03	505	1.76E-01	610	3.33E-01	715	3.12E-02
405	1.28E-03	510	2.00E-01	615	3.20E-01	720	2.69E-02
410	2.50E-03	515	2.20E-01	620	3.04E-01	725	2.32E-02
415	5.71E-03	520	2.35E-01	625	2.87E-01	730	1.97E-02
420	1.17E-02	525	2.47E-01	630	2.68E-01	735	1.68E-02
425	2.37E-02	530	2.56E-01	635	2.47E-01	740	1.44E-02
430	4.54E-02	535	2.64E-01	640	2.27E-01	745	1.24E-02
435	8.33E-02	540	2.72E-01	645	2.06E-01	750	1.06E-02
440	1.46E-01	545	2.79E-01	650	1.86E-01	755	9.05E-03
445	2.53E-01	550	2.86E-01	655	1.66E-01	760	7.81E-03
450	3.74E-01	555	2.94E-01	660	1.48E-01	765	6.70E-03
455	3.51E-01	560	3.03E-01	665	1.30E-01	770	5.79E-03
460	2.35E-01	565	3.12E-01	670	1.15E-01	775	4.95E-03
465	1.78E-01	570	3.22E-01	675	1.00E-01	780	4.25E-03
470	1.39E-01	575	3.31E-01	680	8.74E-02		
475	1.03E-01	580	3.40E-01	685	7.61E-02		
480	8.99E-02	585	3.47E-01	690	6.58E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3850, 0.3835)

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

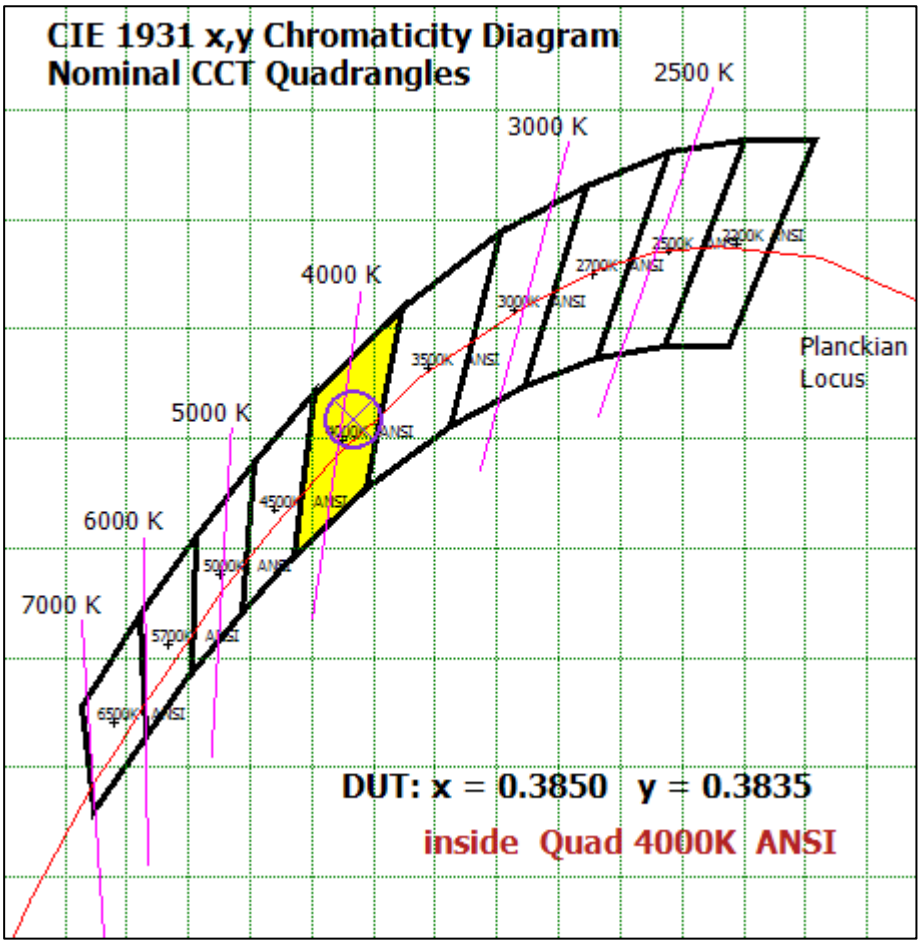
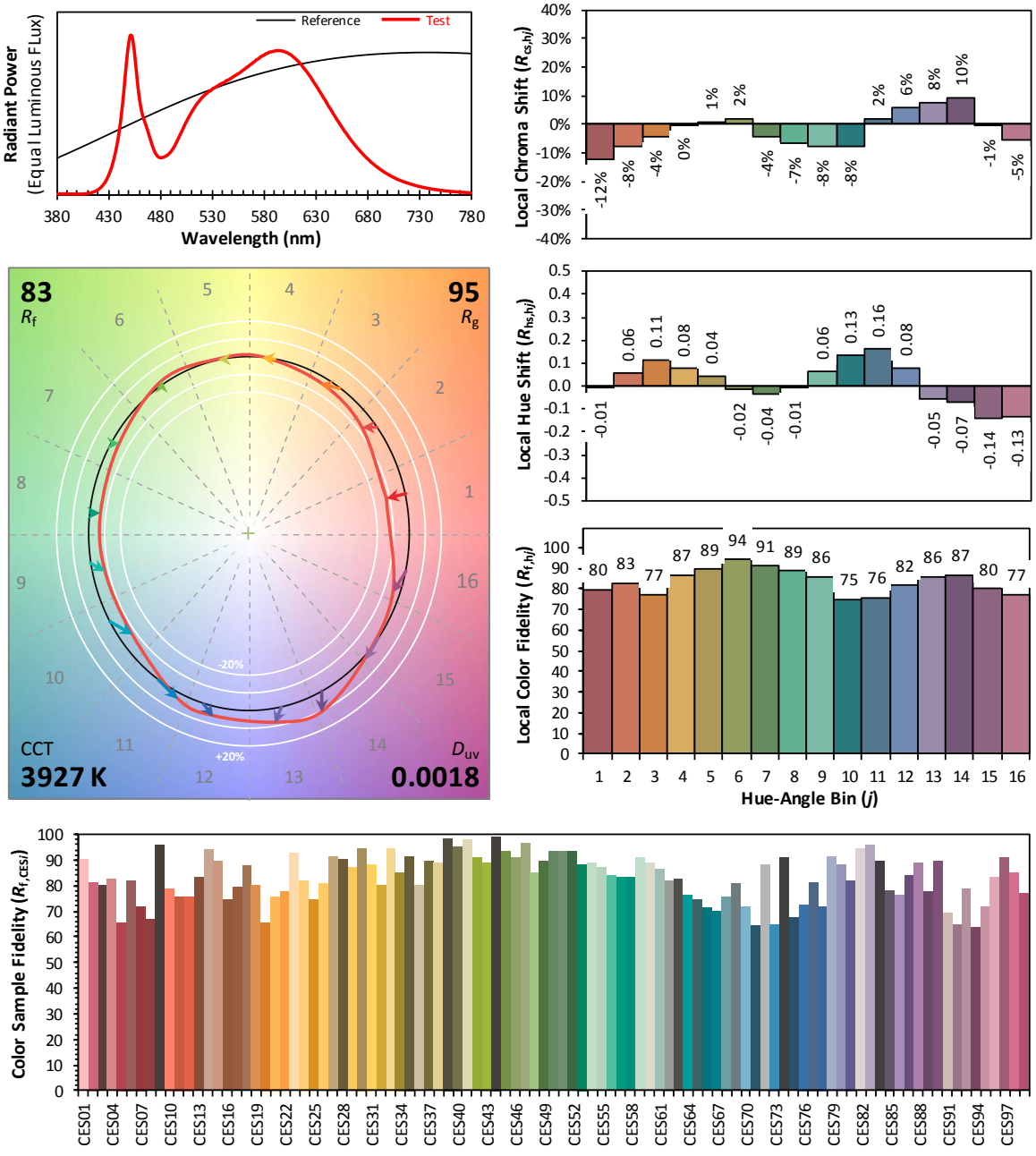


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x	0.3850
y	0.3835
u'	0.2255
v'	0.5052

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	740.492	3.59%
10- 20	2120.784	10.30%
20- 30	3205.182	15.56%
30- 40	3824.358	18.57%
40- 50	3886.96	18.87%
50- 60	3417.273	16.59%
60- 70	2024.564	9.83%
70- 80	769.868	3.74%
80- 90	149.425	0.73%
90-100	44.278	0.21%
100-110	36.289	0.18%
110-120	53.319	0.26%
120-130	69.819	0.34%
130-140	76.373	0.37%
140-150	72.744	0.35%
150-160	59.306	0.29%
160-170	37	0.18%
170-180	9.894	0.05%
Total	20597.9	100%

γ(°)	Lumens	% Total
0- 60	17195.05	83.48%
60- 90	2943.857	14.29%
0-90	20138.91	97.77%
90- 180	459.022	2.23%
0- 180	20597.9	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

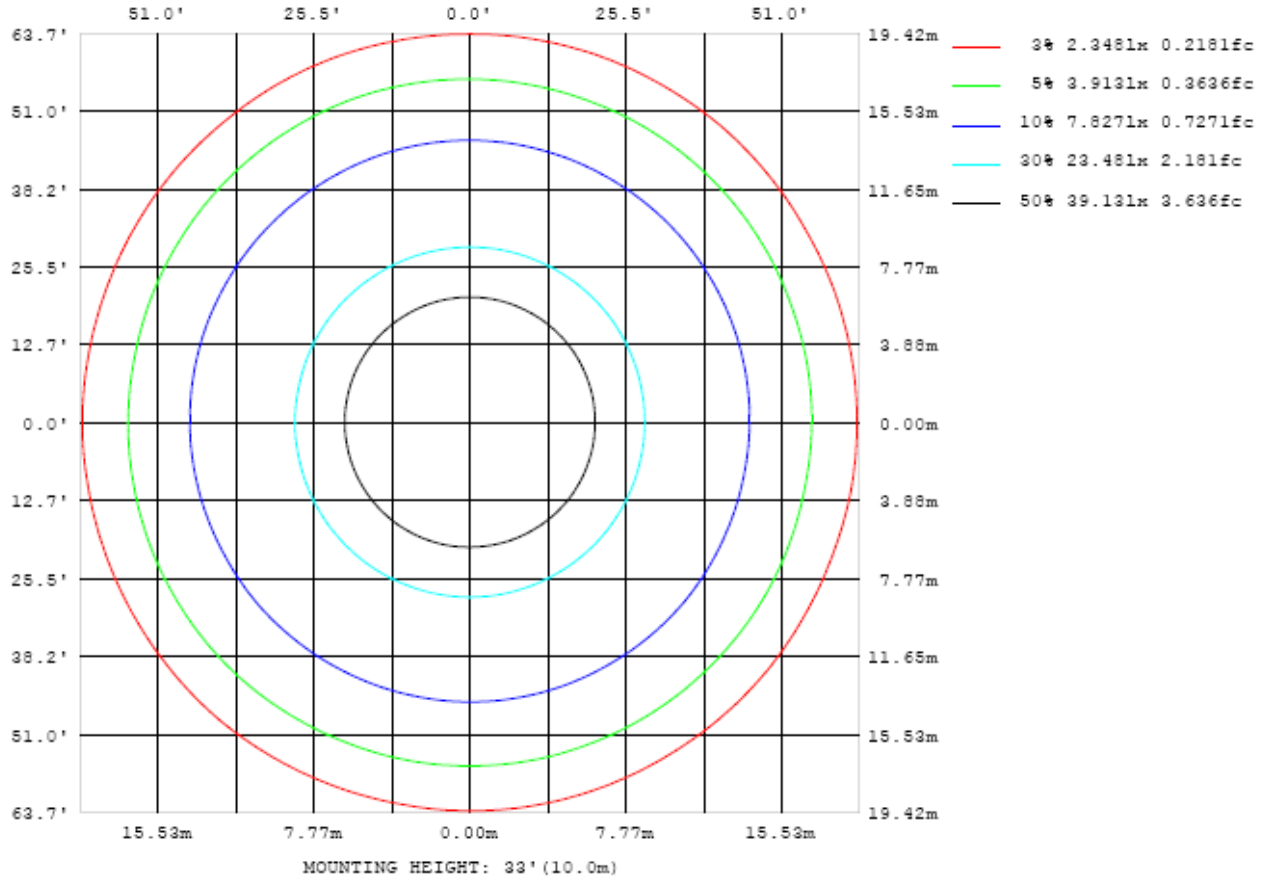


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

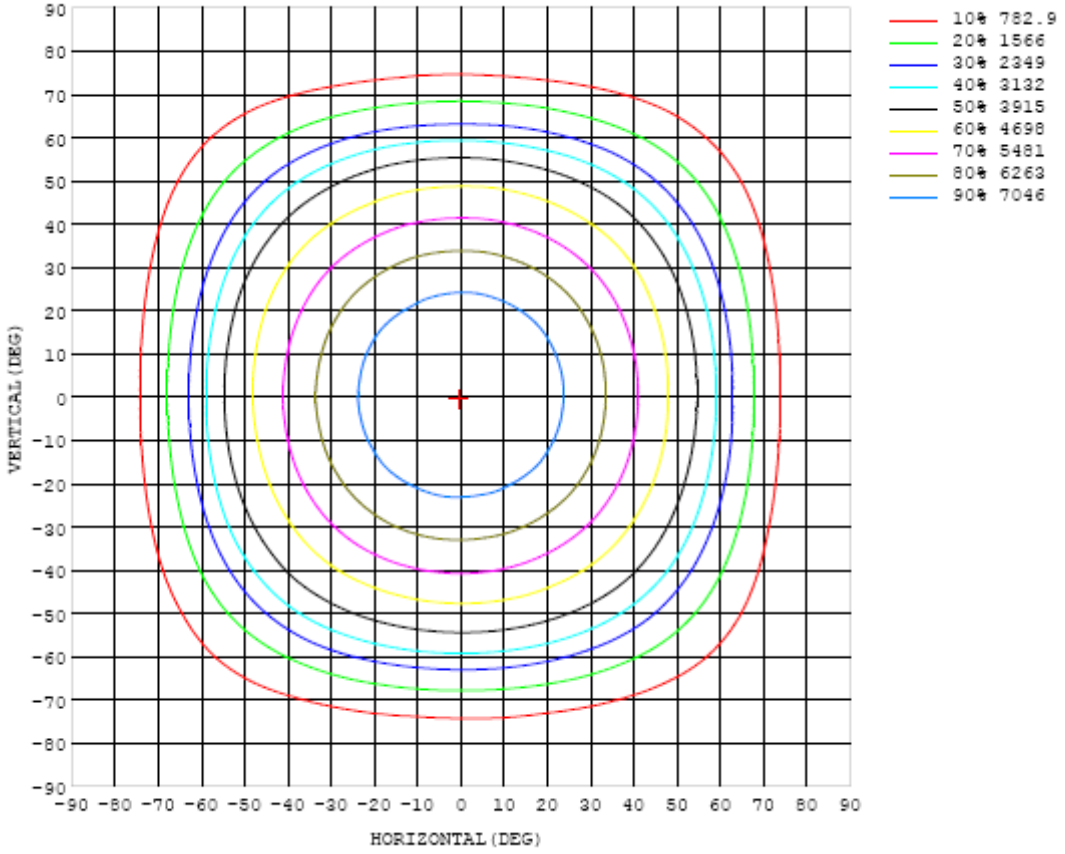


Chart 6: Isocandela Plot

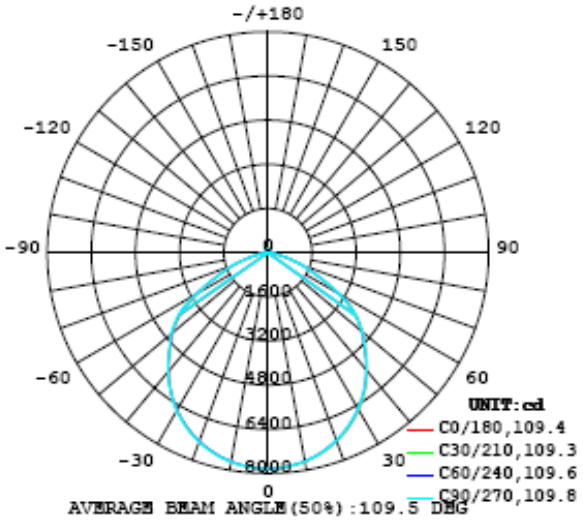


Chart 7: Polar Candela Distribution

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	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827
5	7789	7788	7789	7788	7794	7789	7777	7788	7783	7788	7797	7790	7788	7795	7801	7794	7795	7802	7791
10	7687	7678	7678	7679	7682	7681	7668	7681	7669	7678	7685	7682	7686	7692	7689	7682	7686	7686	7692
15	7520	7511	7510	7512	7510	7497	7488	7498	7492	7494	7500	7501	7503	7510	7514	7513	7519	7516	7524
20	7276	7262	7265	7259	7259	7248	7233	7241	7232	7241	7246	7246	7250	7264	7262	7265	7269	7272	7280
25	6960	6952	6949	6944	6940	6924	6921	6917	6909	6917	6920	6924	6926	6946	6944	6955	6960	6960	6967
30	6572	6564	6559	6557	6548	6533	6518	6527	6515	6524	6533	6545	6544	6551	6554	6558	6564	6578	6589
35	6114	6114	6103	6091	6085	6071	6067	6067	6069	6073	6084	6086	6091	6096	6099	6107	6115	6128	6132
40	5589	5581	5568	5559	5560	5543	5539	5555	5557	5560	5563	5562	5569	5578	5580	5587	5595	5599	5620
45	4999	4997	4991	4991	4988	4972	4959	4976	4980	4988	4984	4981	4985	4992	4996	4996	5006	5022	5036
50	4468	4457	4454	4464	4472	4454	4425	4433	4455	4455	4436	4433	4430	4435	4443	4446	4466	4487	4517
55	3860	3828	3811	3819	3824	3823	3819	3826	3820	3832	3820	3814	3824	3826	3833	3824	3840	3864	3890
60	2934	2905	2911	2930	2934	2942	2947	2958	2977	2976	2974	2969	2973	2989	2986	2968	2960	2942	2935
65	1979	1992	1974	1965	1963	1977	1974	1991	1989	1983	1982	1982	1988	1994	1989	1981	1987	2003	2016
70	1288	1296	1309	1304	1307	1310	1309	1318	1319	1317	1317	1312	1304	1307	1321	1322	1304	1306	1338
75	675	680	688	676	686	674	690	702	718	709	688	696	681	678	701	706	690	699	725
80	275	273	273	272	270	271	261	265	260	265	275	275	280	273	274	280	282	284	295
85	133	134	134	132	131	129	129	130	131	133	132	129	126	129	130	132	135	127	140
90	45.0	46.1	46.2	45.8	45.5	44.4	43.7	43.5	44.0	45.0	44.3	43.6	43.5	45.1	44.4	45.2	44.8	42.3	41.1
95	43.0	42.9	43.6	43.0	41.7	41.3	40.7	39.9	39.5	40.2	40.1	39.6	39.2	39.7	40.9	41.1	40.4	40.2	41.0
100	34.9	35.4	34.0	33.0	33.8	32.8	33.0	32.2	32.8	32.5	33.1	32.7	33.2	33.7	32.9	33.7	33.1	33.1	33.6
105	33.8	33.3	32.7	33.1	32.0	31.4	31.4	30.9	30.8	31.7	32.0	33.1	32.7	32.0	32.2	32.7	31.7	32.0	32.1
110	40.3	40.4	41.4	41.1	37.6	38.5	39.6	40.0	39.8	40.2	39.5	40.8	41.1	41.0	41.5	40.5	40.4	40.2	40.0
115	54.5	54.5	55.1	54.3	50.4	53.1	49.0	53.3	53.4	53.1	52.8	53.2	54.0	54.3	54.6	54.2	54.0	53.0	52.8
120	68.0	65.9	67.8	63.7	62.0	67.1	63.4	64.4	65.1	62.5	66.1	66.2	67.4	65.4	66.9	65.3	65.7	66.6	65.6
125	79.6	76.7	78.5	76.4	77.2	79.8	76.8	78.7	72.1	77.9	76.8	76.7	78.7	75.8	78.4	75.6	76.3	79.4	77.0
130	91.2	86.5	90.6	82.9	87.3	91.2	86.2	89.6	78.4	88.4	87.0	87.1	90.2	86.0	89.7	85.9	86.6	90.9	88.0
135	102	95.2	102	92.9	97.5	102	87.9	97.8	87.1	98.3	96.8	96.6	101	95.4	100	95.8	96.9	102	98.6
140	109	105	112	106	102	112	101	111	92.8	102	106	105	111	104	111	105	107	113	108
145	120	112	118	114	115	114	107	119	99.8	111	114	113	119	112	119	113	116	122	116
150	127	118	127	119	117	127	114	126	111	118	122	119	125	117	126	118	124	128	122
155	132	123	131	117	118	125	124	131	119	130	129	124	131	123	133	125	132	134	128
160	123	120	134	104	126	125	124	132	123	129	126	127	130	128	138	131	138	140	134
165	124	121	124	108	128	103	110	136	117	122	122	125	140	127	142	137	142	144	142
170	112	111	108	105	108	97.2	110	91.5	115	112	121	116	114	127	121	134	133	126	133
175	80.9	85.5	75.1	83.3	88.7	84.0	81.1	80.5	105	89.7	86.9	102	106	115	102	112	117	118	119
180	7.21	7.21	7.21	7.21	7.21	7.21	7.21	7.21	7.21	7.21	7.20	7.20	7.19	7.19	7.18	7.18	7.17	7.17	7.17

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	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827	7827		
5	7790	7798	7799	7801	7793	7789	7794	7791	7793	7800	7789	7792	7793	7795	7792	7791	7792		
10	7689	7689	7698	7695	7694	7689	7701	7695	7701	7701	7693	7695	7697	7706	7694	7691	7691		
15	7518	7518	7525	7527	7518	7517	7529	7525	7537	7539	7530	7529	7534	7537	7529	7527	7525		
20	7275	7285	7289	7289	7283	7283	7293	7293	7305	7301	7301	7295	7299	7300	7291	7285	7282		
25	6967	6974	6976	6981	6975	6966	6979	6983	6991	6997	6990	6986	6988	6985	6980	6973	6971		
30	6591	6601	6605	6608	6597	6596	6607	6609	6610	6615	6608	6600	6600	6607	6596	6596	6582		
35	6134	6144	6148	6153	6143	6145	6157	6152	6156	6160	6156	6149	6150	6148	6144	6139	6130		
40	5620	5623	5633	5631	5628	5630	5646	5642	5642	5648	5636	5629	5627	5626	5614	5611	5602		
45	5038	5056	5062	5061	5056	5060	5075	5066	5068	5068	5064	5055	5045	5038	5035	5019	5006		
50	4539	4568	4566	4565	4548	4551	4583	4581	4589	4561	4548	4531	4533	4526	4516	4517	4489		
55	3903	3920	3915	3928	3933	3950	3971	3974	3978	3961	3941	3926	3918	3916	3896	3895	3887		
60	2922	2944	2958	2980	2989	2999	3017	3000	2991	2975	2973	2984	2981	2968	2958	2935	2939		
65	2022	2023	2030	2039	2044	2046	2041	2035	2041	2043	2045	2028	2020	2004	1988	1992	1994		
70	1352	1347	1355	1350	1351	1356	1374	1389	1383	1364	1351	1329	1334	1342	1344	1325	1316		
75	731	732	743	746	741	730	747	769	764	746	715	725	724	731	714	696	691		
80	290	292	296	300	305	300	308	303	296	293	289	285	278	277	280	281	283		
85	139	142	147	141	141	141	148	148	149	148	151	149	151	148	146	146	139		
90	41.1	40.8	41.5	40.2	39.9	40.1	40.9	40.9	42.1	41.4	40.8	40.2	41.0	41.7	43.7	44.2	44.1		
95	40.5	40.4	40.6	39.6	40.1	39.9	40.4	41.5	41.6	40.9	40.3	38.9	40.1	42.7	42.9	42.7	42.9		
100	32.6	33.8	33.3	32.9	32.7	33.7	33.4	33.0	33.4	33.9	33.5	34.3	33.9	34.7	35.2	35.3	35.5		
105	32.3	33.0	32.4	33.0	32.5	32.3	32.9	33.1	33.2	33.0	33.1	34.1	33.9	34.6	35.0	35.4	34.8		
110	40.2	40.4	41.3	40.9	40.9	40.4	40.6	41.6	42.1	41.4	41.4	41.4	42.1	42.5	42.9	43.0	42.8		
115	54.1	53.4	54.2	53.4	53.6	54.4	54.7	55.9	55.5	55.4	55.0	54.7	56.2	55.7	55.8	55.8	55.1		
120	67.6	66.2	67.4	66.6	67.1	68.7	67.4	69.5	68.3	68.7	68.8	67.6	69.3	67.8	69.3	67.8	64.9		
125	80.0	77.1	79.4	78.0	78.6	81.3	78.3	81.9	79.0	79.9	82.3	78.5	81.9	78.8	80.9	78.6	73.7		
130	92.1	88.1	91.3	88.4	89.0	92.8	88.3	92.9	89.1	90.6	93.8	89.2	93.6	89.0	92.4	88.3	89.2		
135	104	98.4	103	98.5	99.1	104	98.3	104	98.7	101	105	99.0	105	99.1	104	98.5	99.7		
140	114	107	113	108	108	113	107	113	108	112	115	108	115	108	111	108	109		
145	123	116	123	116	116	122	115	122	116	122	123	116	124	116	123	116	116		
150	130	122	130	123	123	129	121	129	122	129	131	122	131	121	125	124	124		
155	136	127	136	131	127	135	126	135	128	134	136	127	136	118	134	133	129		
160	142	132	141	141	132	140	131	140	138	135	142	132	140	133	140	134	132		
165	146	144	142	146	136	144	138	144	145	137	146	136	134	130	132	143	124		
170	127	135	135	129	137	129	136	135	128	135	127	126	124	107	122	109	108		
175	119	126	118	119	125	119	119	119	119	123	110	108	101	96.9	96.1	90.2	80.7		
180	7.17	7.17	7.18	7.18	7.19	7.19	7.20	7.20	7.21	7.21	7.21	7.21	7.21	7.21	7.21	7.21	7.21		

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 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

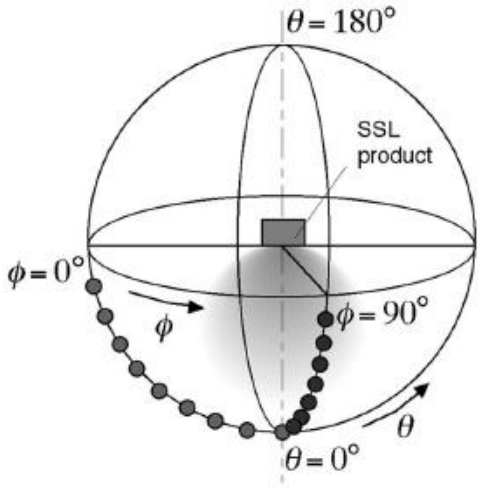
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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