

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/840/BYP/EX39

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20050018a

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

Review by:



Engineer: April Zou
May 19, 2020

Approved by:



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/840/BYP/EX39

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
150.8	17874.8	118.53	0.9830
CCT (K)	CRI	Stabilization Time (Light & Power)	
4145	82.9	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	: 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 High Bay
Model	: 120HIDHB/840/BYP/EX39
Electrical Ratings	: 100-277Vac, 50/60Hz, 120W
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 °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	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	1.005	0.455
Power Factor	0.9830	0.9338
Test Power (W)	118.53	117.76
THD A%	14.13	19.91
Luminous Efficacy (lm/W)	150.8	151.5
Total Luminous Flux (lm)	17874.8	17836.5
Color Rendering Index (CRI)	82.9	
R9	7.3	
Correlated Color Temperature (CCT)(K)	4145	
Chromaticity Chroma x	0.3744	
Chromaticity Chroma y	0.3738	
Chromaticity Chroma u	0.2223	
Chromaticity Chroma v	0.3329	
Duv	0.0005	
Chromaticity Chroma u'	0.2223	
Chromaticity Chroma v'	0.4994	

Special Color Rendering Indices	
R1	81.2
R2	90.5
R3	95.5
R4	80.1
R5	81
R6	86
R7	85.3
R8	63.7
R9	7.3
R10	76.8
R11	78.7
R12	60.7
R13	83.8
R14	98

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 °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)	1.022
Power Factor	0.9815
Power (W)	120.28
Luminous Efficacy (lm/W)	151.0
Total Luminous Flux (lm)	18165.0
Beam Angle (°)	110.9 (0°-180°) / 110.7 (90°-270°)
Center Beam Candle Power (cd)	6465
Maximum Beam Candle Power (cd)	6476 (At: C=60.0, Gamma=2.0)
Spacing Criteria	1.25 (0°-180°) / 1.24 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	80.08%
Zonal Lumens in the 60 °-90 °Zone	16.19%
Zonal Lumens in the 90 °-120 °Zone	0.98%
Zonal Lumens in the 120 °-180 °Zone	2.76%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

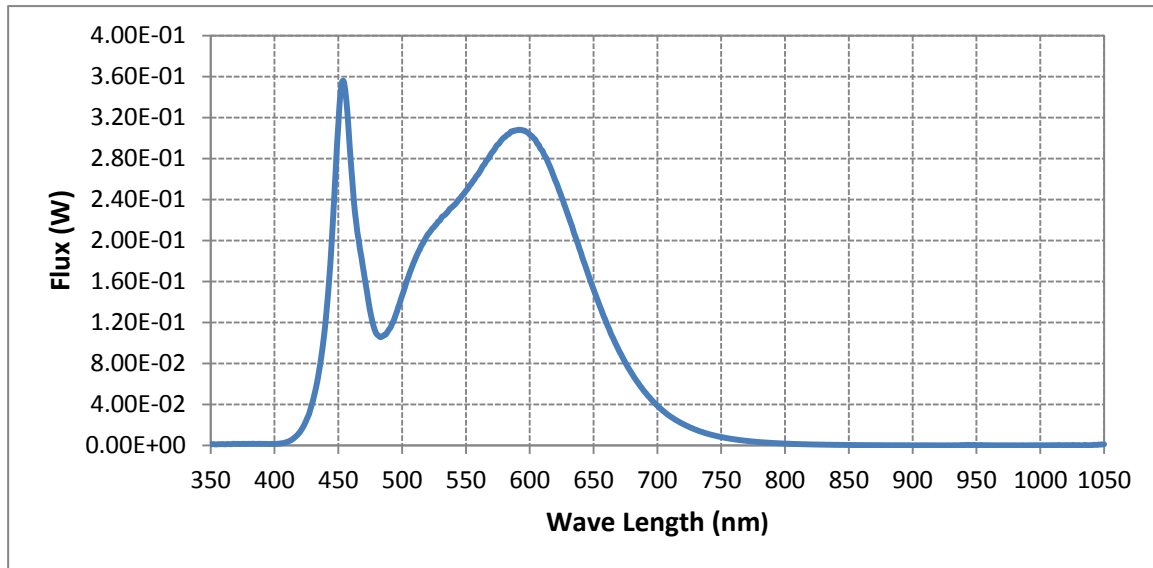
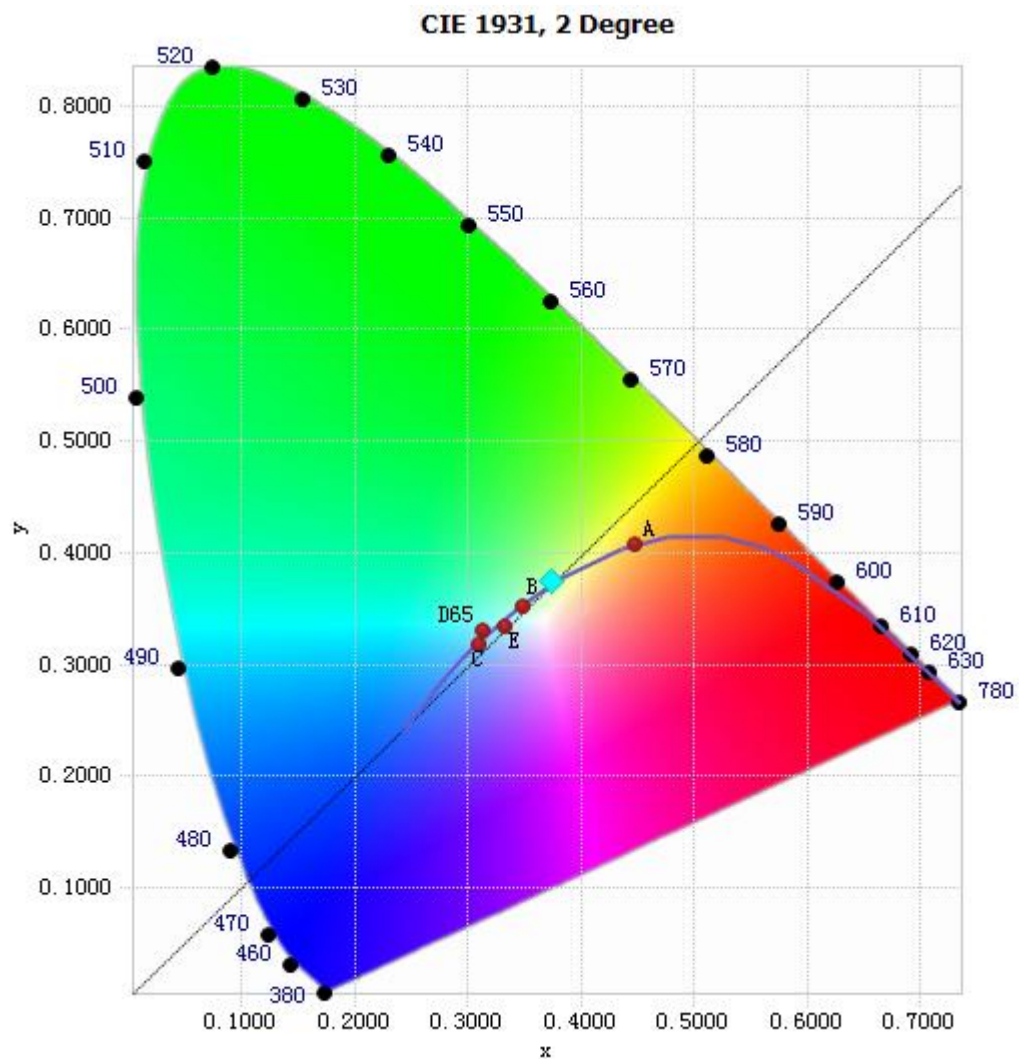


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.64E-03	485	1.07E-01	590	3.08E-01	695	4.52E-02
385	1.54E-03	490	1.14E-01	595	3.07E-01	700	3.88E-02
390	1.57E-03	495	1.28E-01	600	3.03E-01	705	3.33E-02
395	1.45E-03	500	1.46E-01	605	2.97E-01	710	2.84E-02
400	1.56E-03	505	1.65E-01	610	2.88E-01	715	2.44E-02
405	2.02E-03	510	1.81E-01	615	2.74E-01	720	2.10E-02
410	3.50E-03	515	1.95E-01	620	2.59E-01	725	1.80E-02
415	6.95E-03	520	2.06E-01	625	2.42E-01	730	1.54E-02
420	1.33E-02	525	2.13E-01	630	2.25E-01	735	1.32E-02
425	2.48E-02	530	2.20E-01	635	2.06E-01	740	1.12E-02
430	4.31E-02	535	2.27E-01	640	1.89E-01	745	9.60E-03
435	7.34E-02	540	2.34E-01	645	1.70E-01	750	8.24E-03
440	1.21E-01	545	2.41E-01	650	1.52E-01	755	7.08E-03
445	2.03E-01	550	2.49E-01	655	1.36E-01	760	6.10E-03
450	3.13E-01	555	2.57E-01	660	1.20E-01	765	5.18E-03
455	3.51E-01	560	2.66E-01	665	1.06E-01	770	4.47E-03
460	2.74E-01	565	2.75E-01	670	9.24E-02	775	3.83E-03
465	2.07E-01	570	2.85E-01	675	8.07E-02	780	3.32E-03
470	1.69E-01	575	2.94E-01	680	7.02E-02		
475	1.31E-01	580	3.01E-01	685	6.09E-02		
480	1.09E-01	585	3.06E-01	690	5.24E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3744, 0.3738)

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

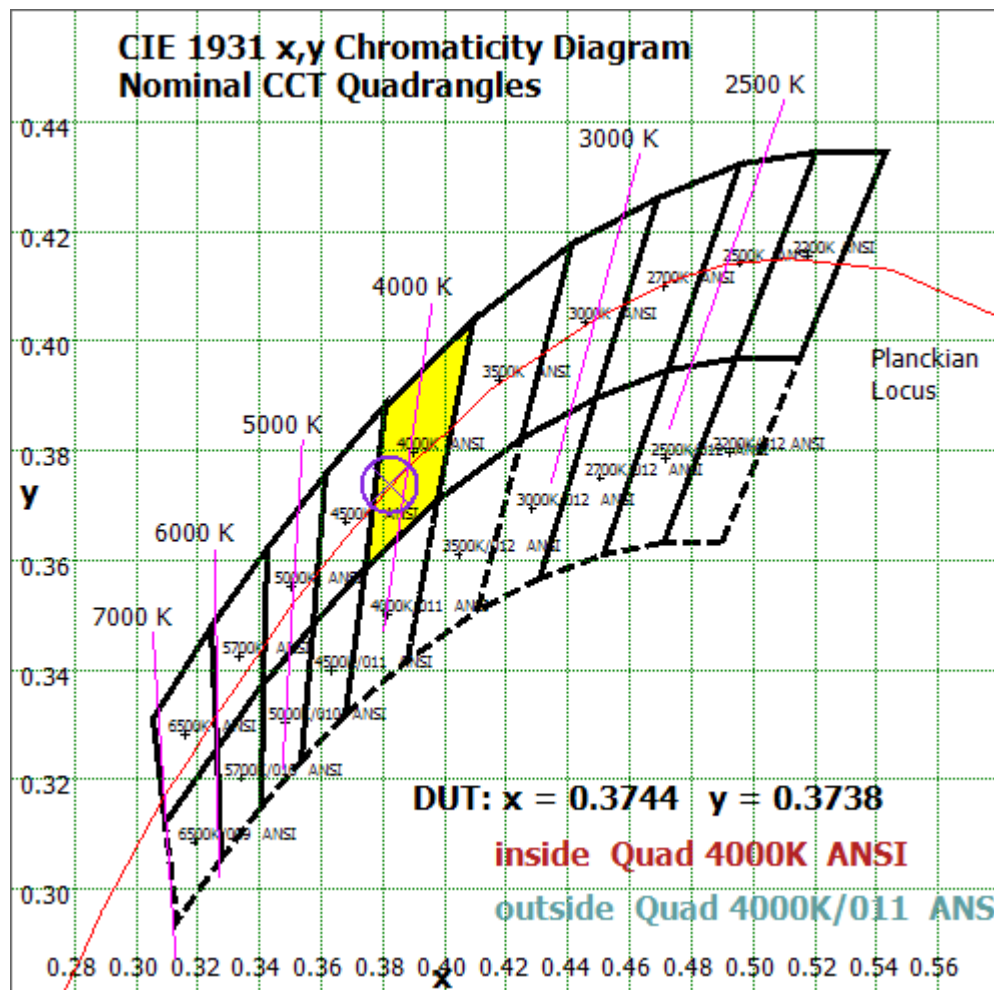
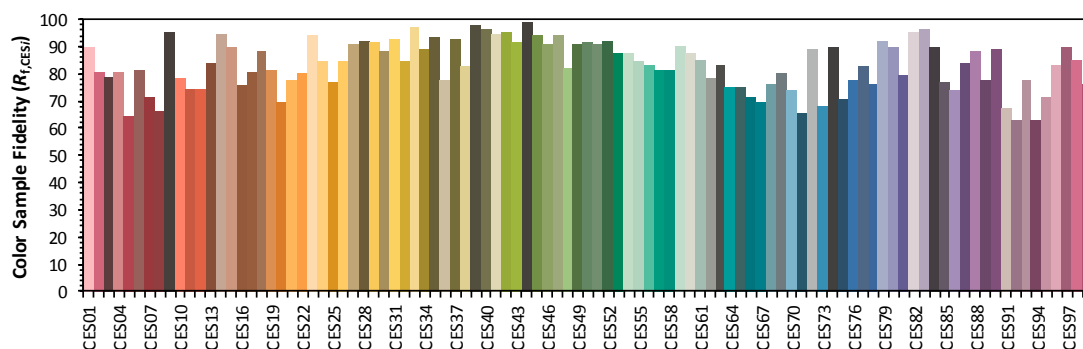
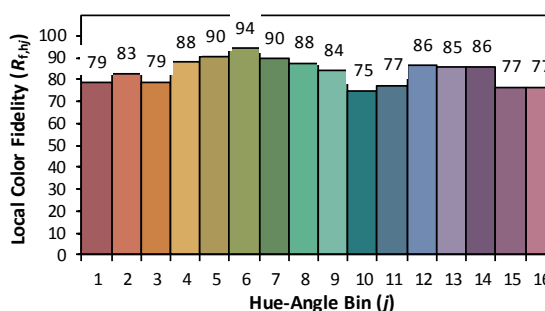
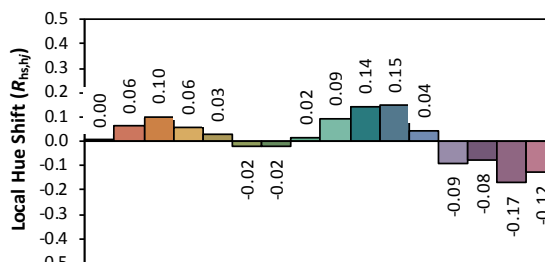
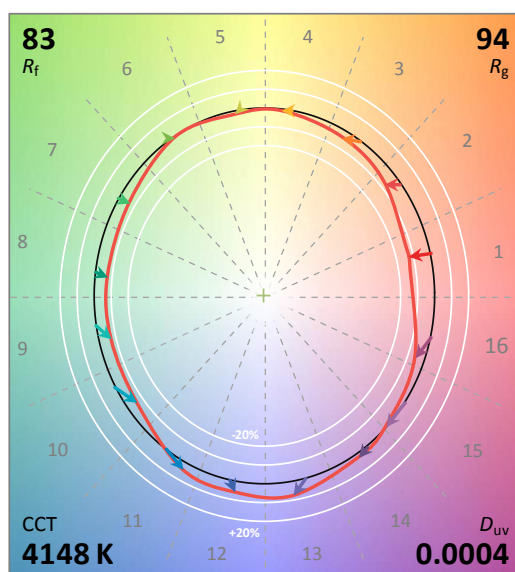
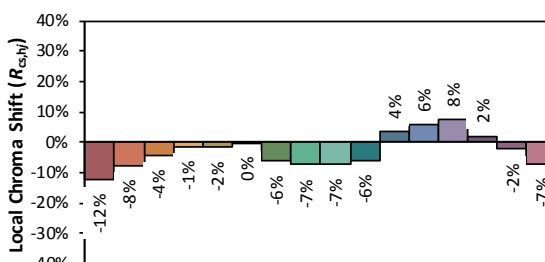


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram



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

V' 0.4994

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	608.908	3.35%
10- 20	1746.315	9.61%
20- 30	2658.741	14.64%
30- 40	3219.591	17.72%
40- 50	3360.537	18.50%
50- 60	2952.016	16.25%
60- 70	1976.828	10.88%
70- 80	822.898	4.53%
80- 90	141.069	0.78%
90-100	39.704	0.22%
100-110	62.306	0.34%
110-120	75.728	0.42%
120-130	103.567	0.57%
130-140	117.292	0.65%
140-150	113.727	0.63%
150-160	93.937	0.52%
160-170	56.952	0.31%
170-180	15.293	0.08%
Total	18165.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	14546.11	80.08%
60- 90	2940.795	16.19%
0-90	17486.9	96.26%
90- 180	678.506	3.74%
0- 180	18165.4	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

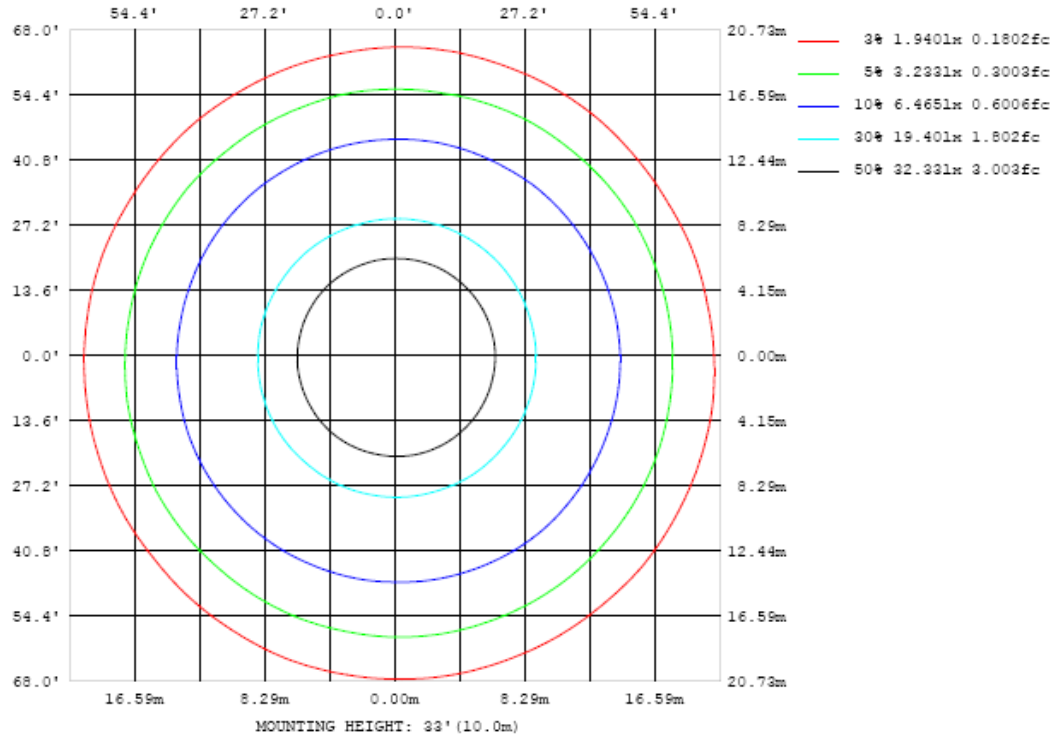


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

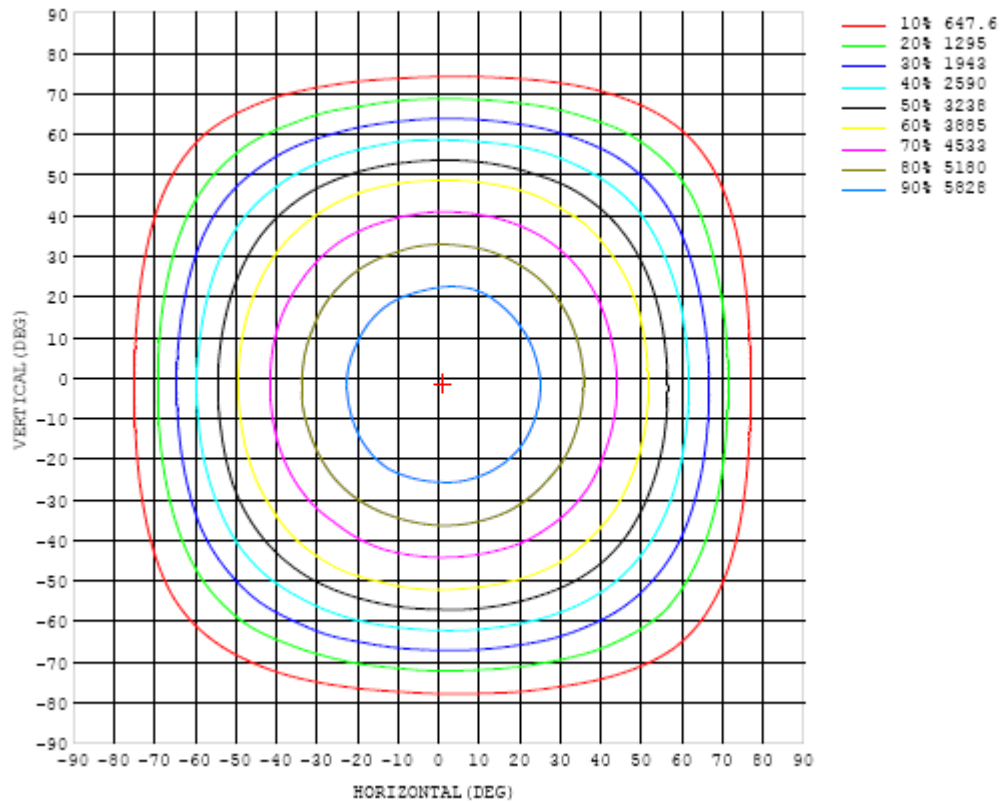


Chart 6: Isocandela Plot

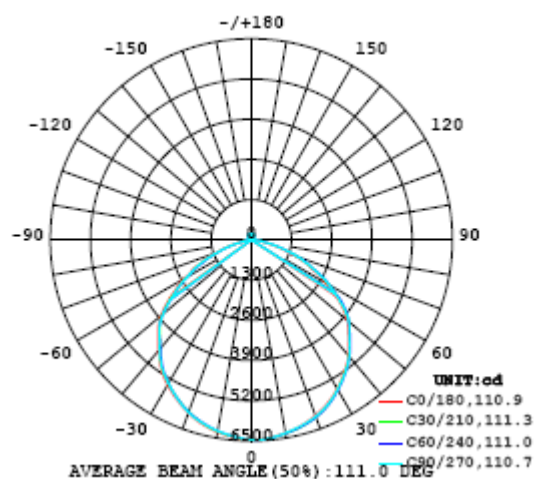


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1		UNIT: cd																	
C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465
5	6427	6432	6439	6446	6447	6450	6450	6445	6446	6442	6437	6431	6427	6429	6425	6419	6417	6410	6412
10	6335	6346	6355	6361	6363	6362	6357	6348	6342	6337	6331	6326	6325	6326	6326	6323	6324	6315	6311
15	6213	6233	6242	6254	6261	6257	6249	6238	6228	6216	6214	6212	6209	6208	6202	6195	6191	6176	6164
20	6046	6068	6085	6101	6113	6113	6107	6095	6087	6074	6070	6071	6067	6053	6028	6006	5996	5978	5961
25	5828	5841	5855	5876	5893	5896	5893	5891	5883	5864	5860	5851	5850	5829	5793	5758	5732	5713	5696
30	5556	5559	5566	5582	5601	5609	5613	5604	5602	5581	5570	5565	5562	5539	5504	5468	5444	5436	5419
35	5228	5231	5242	5260	5259	5273	5292	5291	5287	5274	5248	5228	5218	5205	5184	5154	5131	5120	5086
40	4879	4892	4902	4915	4903	4927	4937	4916	4916	4917	4883	4862	4833	4798	4791	4765	4724	4697	4671
45	4439	4458	4457	4496	4501	4495	4508	4490	4481	4468	4456	4446	4407	4363	4361	4346	4331	4302	4263
50	4044	4084	4093	4129	4108	4113	4114	4098	4109	4108	4083	4048	4062	4017	3983	3927	3899	3850	3822
55	3469	3507	3516	3545	3573	3609	3603	3577	3556	3517	3506	3468	3454	3417	3380	3339	3293	3204	3163
60	2759	2798	2840	2874	2881	2903	2888	2892	2892	2889	2847	2834	2787	2744	2718	2687	2621	2593	2520
65	2115	2166	2185	2189	2217	2190	2192	2188	2201	2188	2201	2157	2116	2101	2059	2012	2009	1938	1858
70	1503	1545	1592	1564	1613	1646	1605	1638	1654	1584	1585	1490	1488	1407	1395	1338	1283	1222	1212
75	859	893	931	960	979	975	979	967	956	956	915	888	859	823	789	754	743	698	650
80	371	393	409	428	436	453	452	453	446	428	421	393	373	358	326	303	276	253	237
85	114	119	128	135	137	140	144	143	143	141	135	128	125	110	106	101	99.9	97.8	94.5
90	59.1	61.5	62.0	62.0	65.3	66.5	66.7	67.4	66.3	62.8	60.6	62.7	59.4	55.0	51.1	50.4	49.0	48.9	44.7
95	31.8	32.2	32.7	32.8	33.6	34.7	34.9	35.0	33.4	34.3	34.2	32.6	32.3	31.8	30.6	30.1	30.3	29.9	29.6
100	37.5	37.8	36.2	34.5	33.5	34.2	32.3	31.6	31.5	31.9	33.1	33.0	33.3	36.3	35.7	39.0	39.9	40.0	45.1
105	61.1	60.3	61.1	62.6	61.2	63.9	61.1	61.9	58.9	59.5	56.5	55.9	60.8	60.1	61.8	67.8	67.8	69.0	68.4
110	60.4	55.6	59.2	61.1	55.1	56.6	59.0	57.4	58.9	58.7	55.3	57.7	60.3	57.3	59.4	63.5	58.8	61.2	66.9
115	74.0	72.0	70.6	72.5	69.1	69.1	69.0	68.8	70.9	71.6	69.0	70.8	73.9	73.5	74.5	76.0	75.8	77.5	79.0
120	92.8	90.2	91.2	92.2	91.0	89.8	89.9	90.1	90.3	90.5	90.7	92.3	93.5	94.6	94.5	96.4	96.2	98.5	99.7
125	112	111	110	111	109	109	112	111	112	114	112	114	116	113	115	119	118	119	122
130	132	128	127	131	126	127	131	128	129	134	130	131	137	133	134	139	134	136	142
135	151	145	145	150	144	144	152	145	146	154	147	148	156	149	150	158	151	152	162
140	168	160	159	167	158	159	167	159	160	171	162	162	174	163	164	176	165	166	180
145	185	173	174	184	172	172	184	171	171	186	173	173	188	176	176	190	177	177	195
150	198	185	187	199	184	184	199	183	183	199	185	185	201	187	187	203	188	189	208
155	209	195	198	211	195	195	211	194	194	212	196	195	214	197	197	215	185	197	220
160	220	204	214	220	204	204	221	205	205	222	210	205	223	221	206	193	186	185	205
165	209	209	209	213	209	209	211	210	209	227	210	209	210	190	174	187	197	159	175
170	193	210	191	192	210	203	191	196	189	190	190	207	188	188	154	163	129	130	126
175	195	201	187	187	204	186	159	148	163	165	164	164	160	143	141	124	93.8	94.0	107
180	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465	6465		
5	6403	6398	6392	6388	6384	6384	6378	6378	6382	6382	6385	6387	6395	6399	6402	6412	6418		
10	6305	6293	6288	6279	6271	6271	6265	6267	6272	6273	6278	6280	6286	6295	6304	6313	6323		
15	6155	6141	6128	6119	6112	6116	6114	6121	6131	6146	6156	6158	6157	6162	6170	6183	6194		
20	5947	5926	5914	5917	5919	5922	5921	5926	5946	5975	5999	6005	6000	5998	6000	6011	6022		
25	5677	5657	5652	5655	5656	5655	5649	5653	5667	5692	5727	5738	5733	5739	5758	5779	5799		
30	5398	5375	5366	5370	5369	5356	5349	5358	5364	5380	5411	5421	5425	5444	5471	5497	5522		
35	5071	5052	5046	5018	5008	5006	5003	5027	5041	5037	5057	5084	5102	5137	5162	5182	5202		
40	4658	4629	4598	4581	4579	4574	4568	4590	4618	4625	4651	4679	4708	4751	4773	4795	4832		
45	4239	4215	4192	4183	4205	4216	4208	4201	4210	4239	4257	4295	4318	4331	4364	4386	4396		
50	3790	3766	3751	3737	3717	3728	3707	3716	3714	3746	3791	3843	3857	3930	3950	3989	4003		
55	3106	3083	3067	3051	3050	3010	3012	3030	3043	3079	3085	3117	3184	3236	3290	3351	3419		
60	2471	2448	2409	2411	2339	2350	2346	2379	2389	2395	2448	2500	2531	2598	2662	2690	2723		
65	1838	1797	1795	1756	1723	1728	1750	1767	1806	1807	1810	1861	1908	1980	2020	2073	2071		
70	1166	1148	1145	1107	1105	1091	1087	1090	1122	1130	1144	1188	1225	1296	1332	1370	1410		
75	620	597	578	554	551	548	556	562	575	587	616	650	686	690	725	778	838		
80	223	215	210	203	193	192	201	205	211	207	222	221	244	271	298	326	348		
85	87.7	82.6	80.8	78.0	77.4	76.3	78.2	75.1	77.9	80.5	84.5	88.2	88.5	91.2	92.7	98.6	108		
90	44.5	41.2	39.7	42.7	42.2	40.1	41.2	39.6	39.6	43.0	42.7	43.6	43.0	43.9	43.2	50.5	53.3		
95	29.9	29.5	29.9	30.5	30.7	31.1	30.8	30.1	31.0	31.6	30.5	30.2	29.8	30.1	31.1	31.9	32.4		
100	44.3	46.7	47.4	46.3	49.1	50.5	47.2	52.9	54.3	50.4	48.7	49.8	45.9	45.9	45.1	41.2	38.9		
105	64.1	62.7	65.2	63.3	62.2	62.5	65.1	66.2	68.6	67.8	65.2	67.7	67.7	63.9	60.5	60.3	60.4		
110	60.5	63.9	67.7	63.5	67.1	66.9	65.2	68.3	68.1	65.8	65.7	66.6	61.0	63.0	63.5	58.1	59.7		
115	78.8	81.3	81.7	81.0	81.2	81.7	81.1	80.7	80.1	78.4	79.3	77.3	73.2	74.6	76.0	74.0	73.4		
120	101	100	101	101	102	103	102	102	103	101	98.8	97.1	95.2	94.0	92.3	91.8	93.6		
125	120	121	125	121	121	123	120	119	120	118	118	119	117	116	115	113	113		
130	137	139	146	139	140	144	138	136	139	136	139	140	135	136	135	131	133		
135	154	154	164	153	155	163	155	156	160	154	159	158	151	152	150	147	151		
140	168	167	180	168	170	179	168	172	176	167	176	172	164	172	167	163	169		
145	181	181	195	181	184	196	182	191	192	181	193	185	178	191	182	176	187		
150	192	193	196	193	196	209	194	206	204	193	207	196	190	204	193	188	201		
155	194	200	202	199	187	221	204	218	216	203	220	206	201	217	203	199	214		
160	205	206	224	214	204	217	210	228	228	211	229	227	210	227	223	209	225		
165	162	166	171	173	206	200	213	212	195	213	213	197	213	212	213	213	211		
170	115	155	173	166	189	190	179	174	175	177	193	194	211	194	194	211	193		
175	108	151	159	127	149	158	171	171	157	160	162	165	167	162	180	180	181		
180	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1	32.1		

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 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 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 expanded uncertainty is 2.3% with a coverage factor $k=2$.

Color Characteristics Measurements

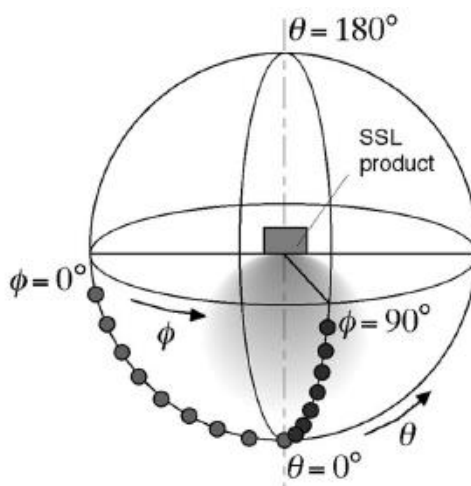
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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