



LM-79-08 Test Report

for

ABB Lighting, Inc.

3 Adams St Belvidere, NJ 07823.

Linear High bay

Model: LHB200501-82

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

No.1805, DongLiu road, BinJiang District, Hangzhou, China

Tel: +86-571-56680806

www.ledtestlab.com

Report No.: HZ15080005c

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

Reviewed by:

April Zou

Engineer: April Zou
Aug. 10, 2015



Jim Zhang

Manager: Jim Zhang
Aug. 10, 2015

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: **LHB200501-82**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
123.2	24921.0	202.27	0.9827
CCT (K)	CRI	Stabilization Time (Light & Power)	
5117	81.9	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Aug. 04, 2015

Date of Test : Aug. 06, 2015

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

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Sample Photo



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: Linear High bay
Model	: LHB200501-82
Electrical Ratings	: 100~277VAC, 50/60Hz, 200W
Product Description	: 5300K, High-Bay Luminaires for Commercial and Industrial buildings Manufacturer of light source: LG Model of light source: LGIT 5630 Quantity of LED light source: 480pcs
Manufacturer	: ABB Lighting (shanghai) Co., Ltd.
Address	: Room 1012, North Minch Fortune 108 Plaza, # 1839 Qixin road, Shanghai

TEST RESULTS

Test ambient temperature was 24.6°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 85 minutes.

Parameter	Result			Special Color Rendering Indices	
Test Voltage (V)	120.0	100.0	277.0	R1	79
Voltage frequency (Hz)	60	60	60	R2	87
Test Current (A)	1.708	2.051	0.806	R3	93
Power Factor	0.9827	0.9922	0.8977	R4	82
Test Power (W)	202.27	203.63	200.62	R5	81
THD A%	6.68	6.64	12.39	R6	83
Luminous Efficacy (lm/W)	123.2	122.6	124.5	R7	86
Total Luminous Flux (lm)	24921.0	24972.0	24978.0	R8	64
Color Rendering Index (CRI)	81.9			R9	-5
R9	-5			R10	70
Correlated Color Temperature (CCT) (K)	5117			R11	82
Chromaticity (Chroma x, Chroma y)	(0.3425, 0.3579)			R12	68
Chromaticity (Chroma u, Chroma v)	(0.2073, 0.3249)			R13	81
Chromaticity (Chroma u', Chroma v')	(0.2073, 0.4873)			R14	96
Duv	0.0042				
Average Beam Angle (°)	101.2				
Center Beam Candle Power (cd)	10440				
Spacing Criteria	1.35 (0°-180°)/ 1.20 (90°-270°)				
Zonal Lumens in the 0°-60°Zone	91.70%				
Zonal Lumens in the 60°-90°Zone	8.24%				
Zonal Lumens in the 90°-120°Zone	0.02%				
Zonal Lumens in the 120°-180°Zone	0.04%				

Table 2: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u' , v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

Spectral Power Distribution

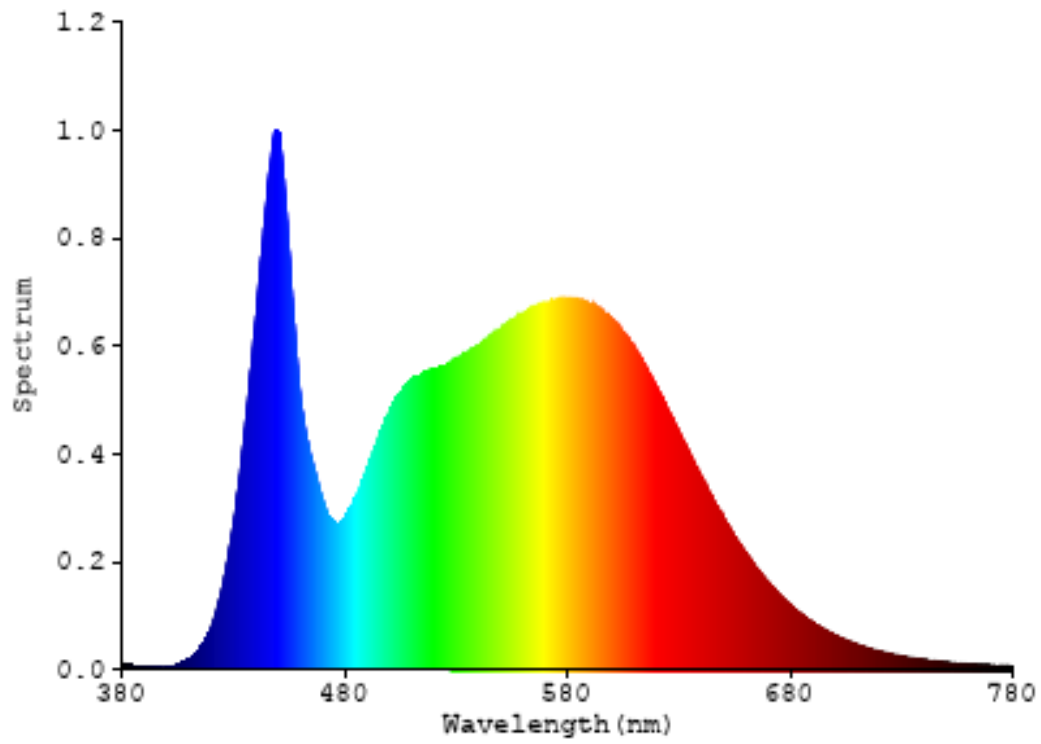


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

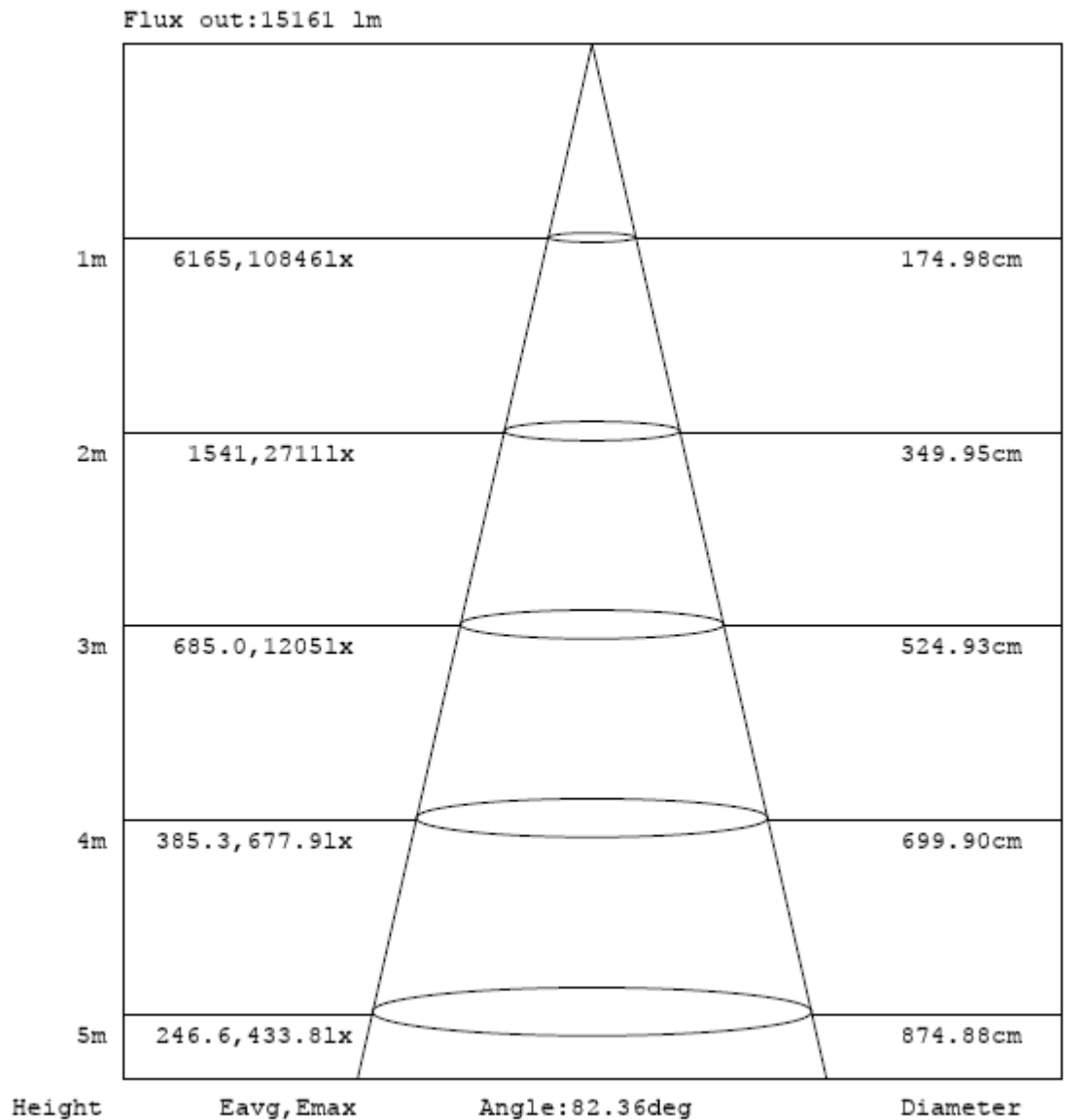
$\gamma(^{\circ})$	Lumens	% Total
0- 10	992.799	3.98%
10- 20	2989.472	12.00%
20- 30	4727.407	18.97%
30- 40	5626.724	22.58%
40- 50	5072.811	20.36%
50- 60	3442.946	13.82%
60- 70	1548.666	6.21%
70- 80	460.648	1.85%
80- 90	43.969	0.18%
90-100	0.88	0.00%
100-110	1.489	0.01%
110-120	1.866	0.01%
120-130	2.281	0.01%
130-140	2.671	0.01%
140-150	2.581	0.01%
150-160	2.14	0.01%
160-170	1.444	0.01%
170-180	0.548	0.00%
Total	24921.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	22852.159	91.70%
60- 90	2053.283	8.24%
0-90	24905.442	99.94%
90- 180	15.9	0.06%
0- 180	24921.3	100%

Table 3: Zonal Lumen Data

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

Illuminance Plots



Note: The Curves indicate the illuminated area and the average illumination when the luminaire is at different distance.

Chart 2: Beam Angle

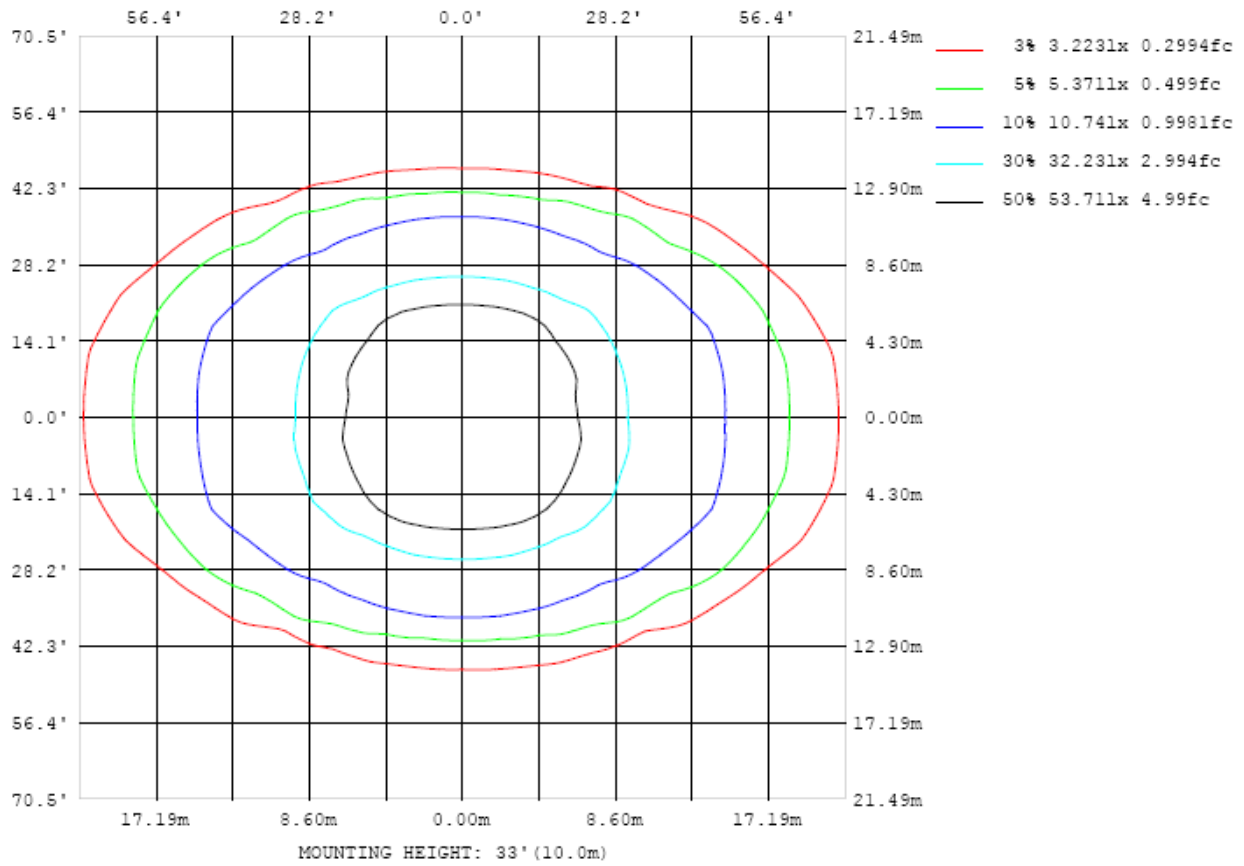


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

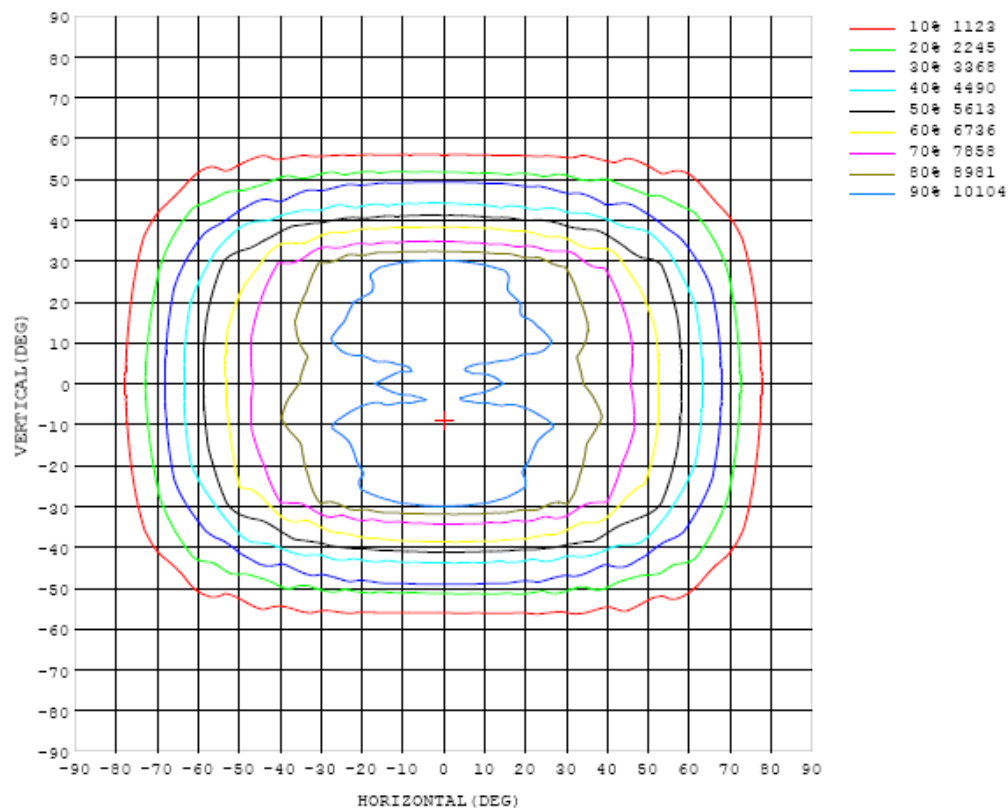


Chart 4: Isocandela Plot

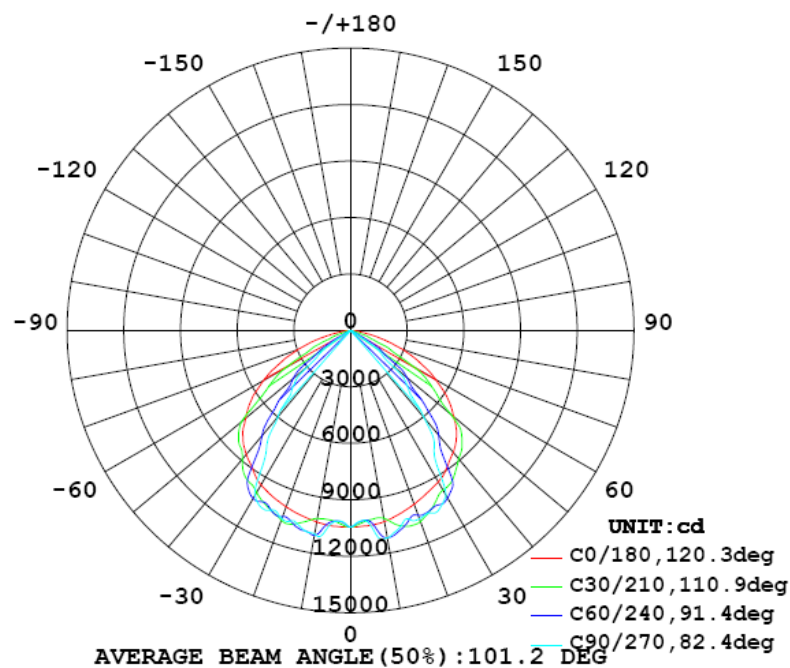


Chart 5: Polar Candela Distribution

Luminous Intensity Data

Table--1

UNIT: ×10cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044
5	1041	1033	1021	1014	1011	1010	1012	1016	1018	1020	1018	1015	1012	1011	1012	1016	1024	1035	1043
10	1031	1013	1001	1013	1059	1104	1119	1120	1119	1119	1119	1120	1120	1103	1057	1012	1004	1019	1033
15	1008	987	1007	1076	1104	1092	1081	1073	1065	1062	1066	1074	1083	1094	1108	1080	1008	999	1016
20	983	963	1042	1080	1061	1031	1045	1061	1064	1065	1065	1061	1044	1033	1065	1084	1052	976	997
25	954	951	1032	1032	1014	1031	1037	1051	1065	1068	1065	1050	1039	1035	1014	1037	1036	962	975
30	929	956	997	979	995	1016	1027	1021	1014	1009	1014	1021	1029	1017	997	980	1004	967	947
35	890	943	939	951	974	976	906	802	777	771	774	795	900	977	978	955	942	951	902
40	845	891	870	890	920	778	724	684	622	604	618	676	714	766	919	888	875	903	859
45	793	826	816	835	710	662	551	450	434	430	433	447	544	648	693	846	824	834	807
50	712	737	733	689	595	444	389	366	294	266	289	364	386	434	583	679	742	740	725
55	626	641	649	529	388	329	216	197	179	163	175	190	207	326	380	519	663	643	640
60	519	527	480	385	266	173	101	42.8	20.4	18.5	19.7	39.8	94.6	162	259	370	466	537	533
65	405	403	340	220	133	35.4	15.3	13.7	12.1	11.6	11.8	13.3	15.1	39.2	125	218	330	410	415
70	289	283	208	96.2	16.2	11.5	11.3	11.7	11.3	10.9	11.0	11.6	11.2	11.4	16.2	91.1	197	289	298
75	170	141	63.2	11.6	9.55	9.83	9.07	8.08	7.11	6.64	7.00	7.85	8.97	10.1	9.45	12.0	60.8	141	176
80	71.1	50.5	8.36	6.79	5.68	4.23	3.72	3.50	3.26	3.11	3.27	3.60	3.72	3.89	5.60	7.40	8.72	51.1	74.5
85	9.72	5.45	2.98	2.10	1.92	1.62	1.28	1.15	1.04	0.98	0.96	1.05	1.23	1.61	1.92	2.10	3.13	5.87	11.2
90	0.18	0.11	0.15	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.03	0.03	0.05	0.15	0.22	0.18
95	0.06	0.07	0.06	0.05	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.07	0.07	0.06	0.07	0.23
100	0.08	0.09	0.08	0.07	0.10	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.11	0.08	0.09	0.10	0.29
105	0.11	0.12	0.10	0.09	0.08	0.06	0.06	0.06	0.05	0.05	0.05	0.06	0.06	0.08	0.09	0.11	0.14	0.12	0.32
110	0.14	0.14	0.13	0.12	0.11	0.10	0.09	0.09	0.08	0.08	0.08	0.09	0.10	0.11	0.13	0.15	0.16	0.16	0.35
115	0.19	0.17	0.16	0.15	0.14	0.14	0.14	0.13	0.12	0.11	0.12	0.13	0.15	0.16	0.17	0.18	0.20	0.18	0.29
120	0.26	0.24	0.20	0.18	0.17	0.18	0.18	0.18	0.16	0.16	0.17	0.18	0.19	0.20	0.21	0.23	0.24	0.23	0.27
125	0.31	0.26	0.22	0.22	0.21	0.22	0.23	0.22	0.22	0.21	0.23	0.24	0.24	0.29	0.26	0.28	0.40	0.30	0.25
130	0.38	0.33	0.28	0.26	0.26	0.27	0.28	0.28	0.27	0.27	0.28	0.29	0.29	0.29	0.29	0.30	0.33	0.37	0.34
135	0.37	0.38	0.34	0.32	0.30	0.32	0.33	0.32	0.32	0.34	0.34	0.34	0.33	0.33	0.32	0.37	0.38	0.40	0.37
140	0.42	0.41	0.38	0.34	0.33	0.35	0.37	0.37	0.37	0.39	0.39	0.38	0.37	0.34	0.41	0.36	0.37	0.40	0.37
145	0.47	0.42	0.40	0.37	0.37	0.38	0.39	0.39	0.41	0.43	0.42	0.38	0.39	0.40	0.37	0.38	0.40	0.53	0.55
150	0.47	0.46	0.45	0.41	0.40	0.40	0.42	0.41	0.41	0.44	0.42	0.41	0.43	0.40	0.39	0.39	0.42	0.44	0.43
155	0.48	0.48	0.47	0.44	0.41	0.42	0.42	0.42	0.43	0.44	0.44	0.42	0.44	0.45	0.41	0.43	0.43	0.48	0.55
160	0.51	0.51	0.49	0.47	0.43	0.42	0.42	0.43	0.43	0.43	0.45	0.43	0.44	0.45	0.45	0.48	0.48	0.49	0.49
165	0.55	0.55	0.52	0.49	0.46	0.43	0.43	0.43	0.42	0.44	0.45	0.45	0.47	0.49	0.51	0.52	0.55	0.57	0.54
170	0.57	0.56	0.56	0.54	0.50	0.47	0.46	0.47	0.50	0.51	0.50	0.50	0.52	0.52	0.53	0.54	0.57	0.58	0.57
175	0.61	0.61	0.61	0.59	0.58	0.55	0.55	0.58	0.60	0.60	0.58	0.56	0.57	0.58	0.56	0.55	0.56	0.58	0.58
180	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63

Table 4: Luminous Intensity Data

Table--2

UNIT: ×10cd

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044		
5	1037	1024	1016	1014	1015	1016	1019	1021	1022	1021	1018	1014	1012	1011	1013	1022	1035		
10	1020	1006	1014	1044	1085	1106	1105	1100	1098	1098	1102	1104	1083	1042	1011	1001	1015		
15	999	1007	1059	1093	1087	1085	1078	1071	1069	1070	1074	1079	1080	1088	1058	1003	995		
20	978	1017	1073	1065	1051	1052	1065	1065	1064	1064	1062	1047	1040	1054	1065	1012	971		
25	963	1039	1036	1024	1041	1029	1033	1050	1054	1048	1028	1021	1030	1010	1023	1032	955		
30	931	1005	994	1006	1000	1030	1028	1019	1013	1014	1019	1021	988	992	977	993	924		
35	886	958	962	959	988	944	829	790	779	783	815	922	970	942	945	942	880		
40	857	883	892	927	817	730	669	611	599	605	657	707	790	905	877	862	848		
45	824	833	838	748	664	551	454	442	437	438	444	533	639	720	818	813	809		
50	746	749	753	597	458	396	369	314	286	309	360	384	436	566	717	723	727		
55	656	641	538	413	334	224	200	162	147	159	191	213	320	390	503	617	635		
60	546	528	396	278	176	99.9	32.6	24.0	22.2	23.6	31.5	96.4	160	262	375	502	530		
65	415	346	225	136	27.4	17.2	14.1	12.1	11.8	12.3	14.0	17.0	26.2	121	213	322	400		
70	285	211	96.9	18.4	11.8	12.0	12.3	10.6	10.0	10.5	12.0	12.1	12.0	18.3	87.2	200	273		
75	146	61.8	11.9	9.69	9.12	8.88	8.10	7.25	6.73	6.90	7.77	9.42	9.43	10.1	13.1	57.6	138		
80	53.1	9.93	6.28	5.91	4.46	3.49	3.17	2.94	2.98	3.06	3.41	3.82	4.77	5.54	6.67	10.9	52.0		
85	5.46	2.96	2.19	1.87	1.58	1.31	1.07	0.97	0.94	0.94	1.04	1.33	1.64	1.98	2.25	3.08	6.03		
90	0.16	0.13	0.09	0.06	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.06	0.09	0.13	0.16		
95	0.24	0.19	0.14	0.10	0.06	0.04	0.03	0.04	0.04	0.04	0.05	0.06	0.06	0.11	0.17	0.19	0.23		
100	0.29	0.25	0.21	0.15	0.10	0.07	0.06	0.05	0.06	0.06	0.08	0.09	0.11	0.27	0.21	0.28	0.30		
105	0.35	0.30	0.26	0.21	0.15	0.12	0.10	0.08	0.08	0.09	0.11	0.14	0.16	0.21	0.28	0.34	0.35		
110	0.30	0.28	0.27	0.26	0.19	0.15	0.13	0.11	0.11	0.12	0.15	0.17	0.20	0.25	0.30	0.33	0.32		
115	0.26	0.28	0.25	0.24	0.20	0.18	0.15	0.14	0.14	0.16	0.18	0.21	0.22	0.25	0.28	0.31	0.28		
120	0.24	0.24	0.23	0.22	0.21	0.19	0.17	0.16	0.16	0.18	0.21	0.23	0.23	0.25	0.27	0.29	0.28		
125	0.25	0.31	0.28	0.25	0.24	0.22	0.21	0.21	0.20	0.22	0.24	0.26	0.25	0.25	0.30	0.50	0.30		
130	0.30	0.28	0.28	0.30	0.28	0.27	0.28	0.28	0.27	0.28	0.30	0.31	0.29	0.28	0.30	0.32	0.45		
135	0.35	0.32	0.33	0.33	0.35	0.33	0.35	0.35	0.36	0.36	0.38	0.38	0.36	0.33	0.39	0.35	0.38		
140	0.37	0.35	0.35	0.37	0.38	0.40	0.41	0.43	0.44	0.43	0.45	0.43	0.38	0.37	0.36	0.37	0.39		
145	0.41	0.41	0.40	0.40	0.42	0.42	0.43	0.47	0.49	0.46	0.46	0.46	0.44	0.40	0.37	0.37	0.40		
150	0.41	0.41	0.42	0.45	0.45	0.48	0.49	0.51	0.51	0.51	0.51	0.49	0.46	0.43	0.41	0.40	0.43		
155	0.49	0.43	0.44	0.45	0.49	0.49	0.51	0.52	0.52	0.52	0.52	0.52	0.48	0.46	0.46	0.44	0.45		
160	0.48	0.48	0.47	0.47	0.51	0.51	0.52	0.53	0.53	0.56	0.54	0.54	0.52	0.50	0.49	0.48	0.49		
165	0.53	0.53	0.53	0.52	0.52	0.53	0.53	0.55	0.56	0.58	0.57	0.56	0.55	0.53	0.52	0.51	0.51		
170	0.56	0.57	0.58	0.58	0.58	0.59	0.60	0.58	0.61	0.65	0.62	0.59	0.58	0.58	0.57	0.54	0.55		
175	0.59	0.59	0.60	0.60	0.60	0.60	0.62	0.62	0.64	0.67	0.66	0.62	0.60	0.59	0.57	0.56	0.61		
180	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Sep. 18, 2014	Sep. 17, 2015
Digital Power Meter	PF2010A	HZTE028-01	Sep. 18, 2014	Sep. 17, 2015
AC Power Supply	PCR 500L	HZTE001-08	Sep. 18, 2014	Sep. 17, 2015
DC Power Supply	WY12010	HZTE004-03	Sep. 18, 2014	Sep. 17, 2015
Temperature Meter	TES1310	HZTE017-01	Sep. 18, 2014	Sep. 17, 2015
Standard source	D908	HZTE012-01	Sep. 18, 2014	Sep. 17, 2015
Standard source	SCL-1400	HZTE012-02	Sep. 18, 2014	Sep. 17, 2015

Table 6: 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.

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 1.94% 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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