



LM-79-08 Test Report

for

ABB Lighting, Inc.

1501 Industrial Way N. Toms River, NJ 08755 RD, Shanghai

25W TROFFER

Model: ABBRT22D2550

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ14100014a

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

Reviewed by:

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Oct. 22, 2014



Jim Zhang

Manager: Jim Zhang
Oct. 22, 2014

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: ABBRT22D2550

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
100.3	2242.8	22.37	0.9842
CCT (K)	CRI	Stabilization Time (Light & Power)	
4860	83.4	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Oct. 20, 2014

Date of Test : Oct. 21, 2014

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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Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: 25W TROFFER
Model	: ABBRT22D2550
Electrical Ratings	: 100~277V AC, 50/60Hz, 25W
Product Description	: 5000K, 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces Manufacturer of light source: EVERLIGHT Model of light source: EVERLIGHT (67-21 S/KK2C-HXXXXXXXXX2934Z6/2T) Quantity of LED light source: 144pcs
Manufacturer	: ABB Lighting (Shanghai) Co., Ltd.
Address	: Room 1012, North Minch Fortune 108 Plaza,# 1839 Qixin road, Shanghai

TEST RESULTS

Test ambient temperature was 24.7°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	81
Voltage frequency (Hz)	60	60	60	R2	89
Test Current (A)	0.189	0.231	0.090	R3	93
Power Factor	0.9842	0.9781	0.9249	R4	81
Test Power (W)	22.37	22.62	22.96	R5	81
THD A%	10.20	9.06	16.38	R6	83
Luminous Efficacy (lm/W)	100.3			R7	89
Total Luminous Flux (lm)	2242.8			R8	70
Color Rendering Index (CRI)	83.4			R9	17
R9	17			R10	72
Correlated Color Temperature (CCT) (K)	4860			R11	79
Chromaticity (Chroma x, Chroma y)	(0.3497, 0.3595)			R12	54
Chromaticity (Chroma u, Chroma v)	(0.2115, 0.3261)			R13	83
Chromaticity (Chroma u', Chroma v')	(0.2115, 0.4892)			R14	96
Duv	0.0021				
Average Beam Angle (°)	93.5				
Center Beam Candle Power (cd)	1003				
Spacing Criteria	1.18 (0°-180°)/ 1.25 (90°-270°)				
Zonal Lumens in the 0°-60°Zone	86.70%				
Zonal Lumens in the 60°-90°Zone	13.18%				
Zonal Lumens in the 90°-120°Zone	0.06%				
Zonal Lumens in the 120°-180°Zone	0.06%				

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

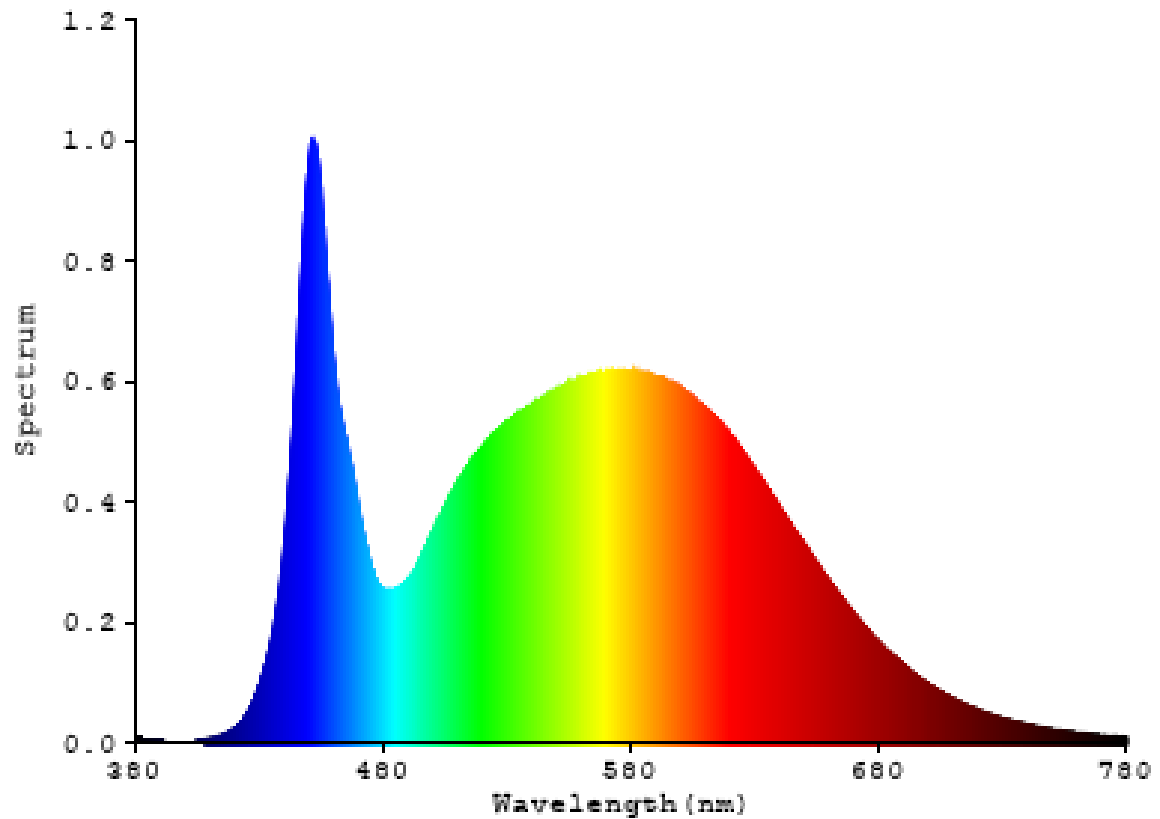


Chart 1: Spectral Power Distribution

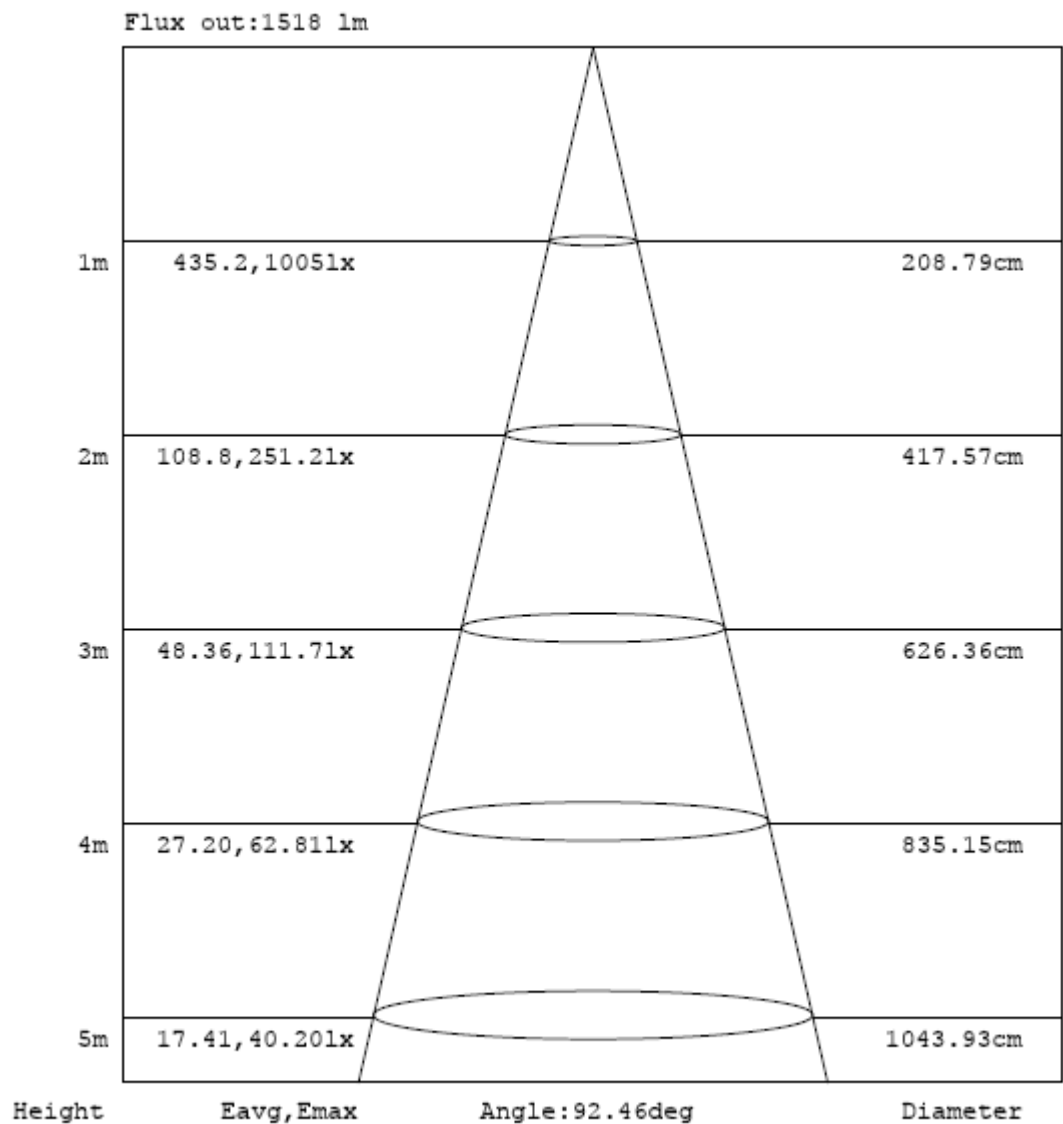
Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	94.713	4.22%
10- 20	271.386	12.10%
20- 30	407.2	18.16%
30- 40	463.414	20.66%
40- 50	416.549	18.57%
50- 60	291.256	12.99%
60- 70	162.057	7.23%
70- 80	98.116	4.37%
80- 90	35.323	1.57%
90-100	0.449	0.02%
100-110	0.457	0.02%
110-120	0.427	0.02%
120-130	0.368	0.02%
130-140	0.339	0.02%
140-150	0.3	0.01%
150-160	0.231	0.01%
160-170	0.149	0.01%
170-180	0.054	0.00%
Total	2242.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1944.518	86.70%
60- 90	295.496	13.18%
0-90	2240.014	99.88%
90- 180	2.774	0.12%
0- 180	2242.8	100%

Table 3: Zonal Lumen Data

Illuminance Plots



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

Chart 2: Beam Angle

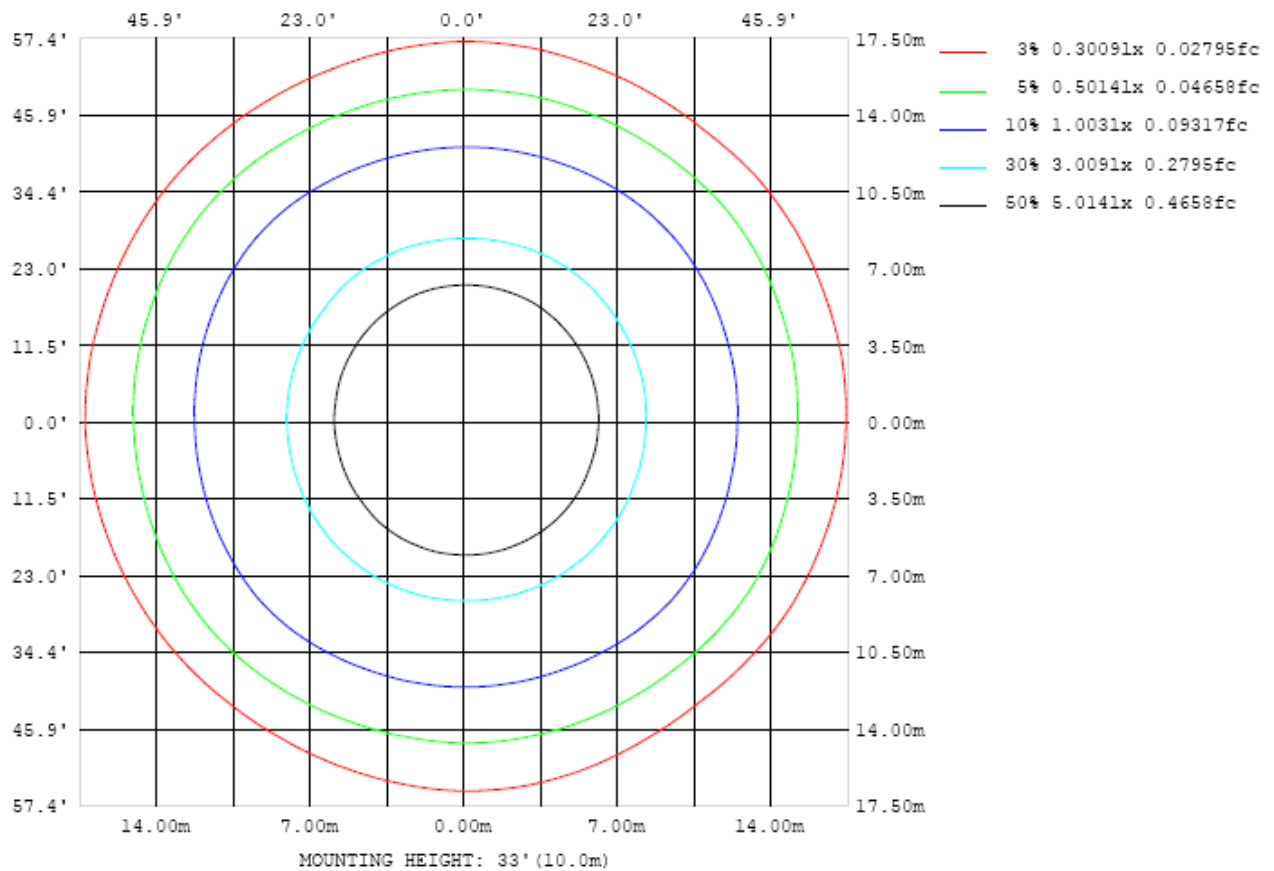


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

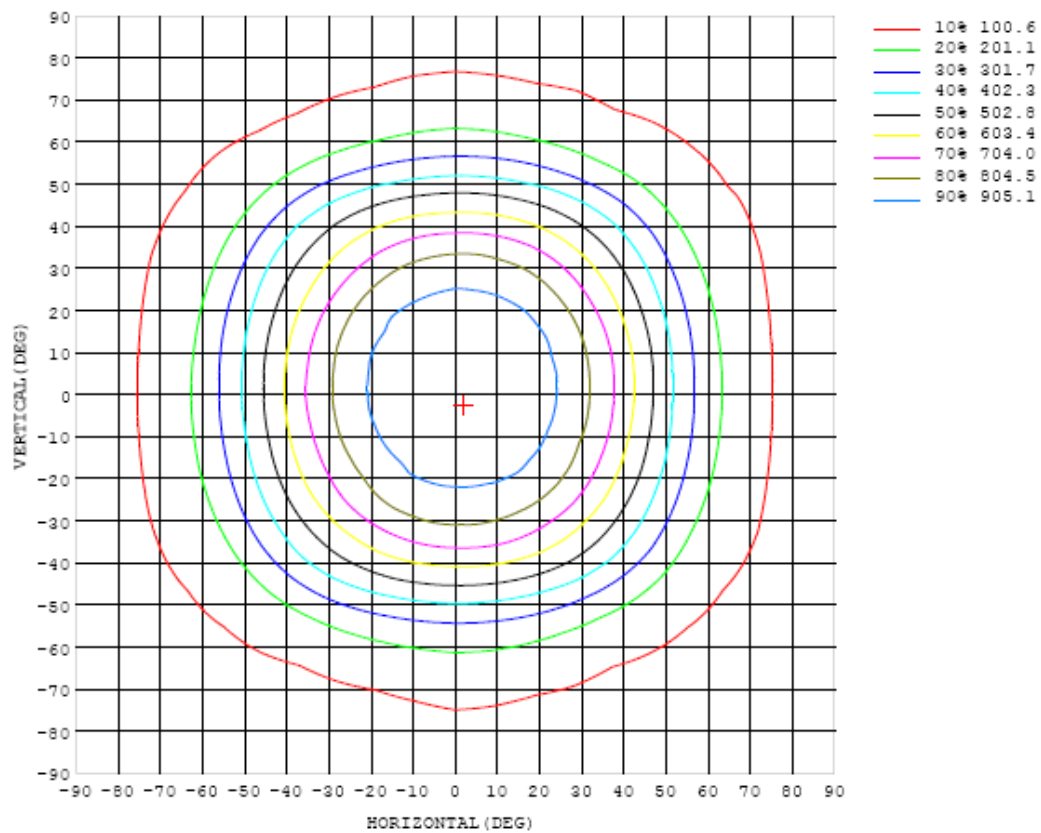


Chart 4: Isocandela Plot

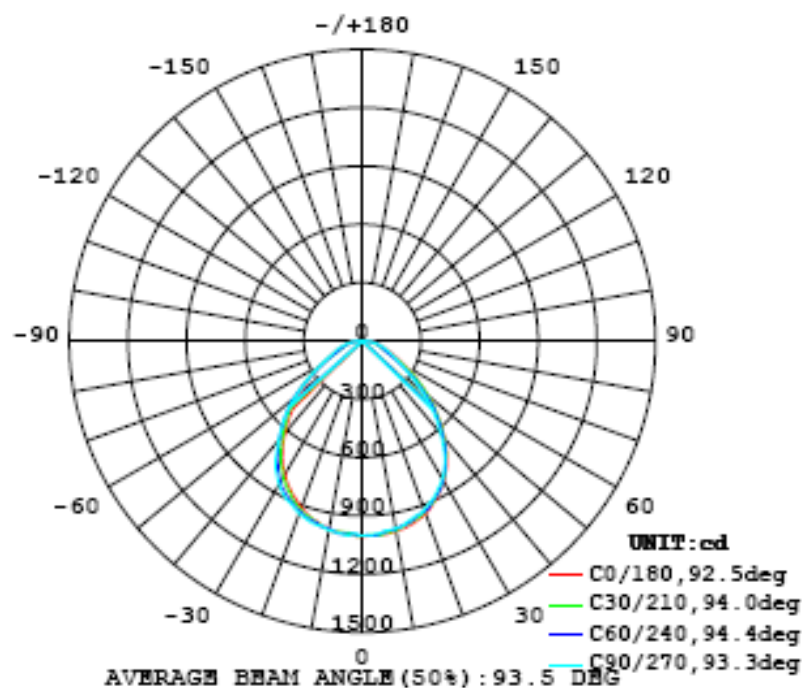


Chart 5: Polar Candela Distribution

Luminous Intensity Data

Table---1 UNIT: cd

C (D&G) γ (D&G)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003
5	1003	999	1003	1005	1001	996	997	1000	997	993	992	994	994	996	998	998	992	992	998
10	993	995	987	989	980	982	982	978	977	977	971	975	974	974	971	979	981	977	981
15	976	973	968	964	963	964	960	957	953	952	951	951	953	950	947	942	951	952	953
20	945	940	937	934	933	928	931	933	929	925	924	921	913	909	910	911	907	913	912
25	895	892	891	886	891	887	886	886	882	878	876	873	870	866	858	852	856	857	860
30	833	830	827	829	827	832	828	823	821	816	816	812	812	804	793	791	789	788	794
35	754	751	745	744	748	746	743	742	739	736	731	728	724	721	717	707	704	706	715
40	655	651	648	650	647	645	642	635	630	624	624	623	623	620	619	617	612	610	616
45	545	542	544	544	544	542	533	524	515	512	512	515	518	523	520	517	512	510	514
50	437	434	436	438	438	429	412	401	396	394	393	397	407	419	423	416	413	410	414
55	334	332	331	333	321	306	297	293	290	290	287	289	296	306	315	317	316	317	321
60	246	242	235	228	215	204	204	210	215	216	211	206	204	205	211	218	225	232	238
65	183	173	157	147	141	135	139	150	162	166	158	146	138	135	138	142	153	169	177
70	137	127	113	106	104	101	107	114	124	131	120	108	104	99.7	103	105	113	128	137
75	103	99.2	85.9	84.3	85.0	84.4	89.2	88.7	96.4	100	89.8	81.8	85.2	80.0	83.2	84.3	86.9	99.1	104
80	70.3	72.9	63.8	59.7	59.4	60.4	63.4	62.9	68.7	65.7	64.5	57.6	60.7	56.1	61.0	60.3	65.7	71.9	70.1
85	38.0	39.4	33.2	24.9	26.6	26.2	22.6	24.9	29.2	26.0	28.6	22.8	23.0	27.6	28.0	27.1	35.1	38.9	38.0
90	1.41	1.63	0.79	0.43	0.36	0.26	0.18	0.12	0.08	0.08	0.10	0.16	0.24	0.34	0.41	0.59	2.40	1.81	0.52
95	0.33	0.70	0.53	0.43	0.41	0.30	0.21	0.14	0.11	0.10	0.14	0.18	0.27	0.37	0.48	0.55	0.58	0.70	0.49
100	0.34	0.73	0.54	0.38	0.44	0.34	0.23	0.15	0.12	0.10	0.14	0.19	0.29	0.45	0.52	0.49	0.59	0.63	0.49
105	0.34	0.69	0.60	0.38	0.36	0.30	0.24	0.17	0.13	0.13	0.17	0.22	0.29	0.36	0.42	0.51	0.62	0.68	0.54
110	0.37	0.69	0.62	0.42	0.38	0.29	0.23	0.19	0.15	0.14	0.17	0.23	0.29	0.35	0.43	0.53	0.67	0.70	0.53
115	0.35	0.66	0.65	0.44	0.38	0.31	0.25	0.23	0.18	0.17	0.19	0.26	0.31	0.37	0.45	0.53	0.67	0.69	0.48
120	0.43	0.66	0.61	0.46	0.40	0.34	0.28	0.26	0.21	0.21	0.22	0.29	0.34	0.39	0.46	0.56	0.60	0.62	0.45
125	0.46	0.61	0.57	0.48	0.41	0.37	0.34	0.29	0.25	0.24	0.26	0.32	0.38	0.41	0.44	0.54	0.51	0.54	0.43
130	0.36	0.55	0.53	0.51	0.43	0.38	0.36	0.33	0.29	0.29	0.30	0.35	0.40	0.41	0.51	0.55	0.50	0.51	0.42
135	0.51	0.58	0.49	0.48	0.47	0.44	0.39	0.36	0.33	0.33	0.34	0.36	0.38	0.48	0.52	0.51	0.56	0.47	0.46
140	0.52	0.55	0.55	0.49	0.48	0.45	0.41	0.38	0.36	0.37	0.37	0.39	0.43	0.41	0.51	0.49	0.58	0.47	0.48
145	0.54	0.57	0.57	0.50	0.47	0.45	0.43	0.40	0.40	0.40	0.39	0.41	0.45	0.47	0.45	0.57	0.60	0.50	0.52
150	0.57	0.58	0.58	0.53	0.47	0.46	0.44	0.43	0.42	0.43	0.42	0.43	0.45	0.47	0.52	0.49	0.52	0.48	0.54
155	0.57	0.54	0.54	0.52	0.50	0.46	0.43	0.43	0.43	0.44	0.44	0.44	0.45	0.50	0.55	0.56	0.55	0.53	0.51
160	0.54	0.52	0.55	0.53	0.49	0.46	0.46	0.45	0.45	0.44	0.46	0.47	0.48	0.50	0.53	0.56	0.54	0.57	0.57
165	0.54	0.53	0.53	0.53	0.51	0.49	0.48	0.48	0.48	0.47	0.48	0.51	0.52	0.53	0.54	0.54	0.55	0.55	0.55
170	0.55	0.54	0.54	0.54	0.54	0.50	0.49	0.49	0.52	0.51	0.49	0.52	0.53	0.55	0.55	0.55	0.55	0.55	0.57
175	0.61	0.60	0.60	0.60	0.59	0.58	0.56	0.56	0.57	0.56	0.56	0.58	0.59	0.60	0.60	0.61	0.61	0.61	0.61
180	0.61	0.61	0.60	0.60	0.60	0.59	0.58	0.56	0.56	0.56	0.55	0.54	0.56	0.58	0.58	0.57	0.59	0.59	0.60

Table 4: Luminous Intensity Data

Table--2

UNIT: cd

C (DNG) γ (DNG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003	1003		
5	994	988	991	993	996	998	1001	1003	1003	1003	1003	1003	1002	1000	995	993	1001		
10	972	982	983	984	982	982	988	987	988	992	989	990	988	997	995	989	988		
15	951	956	957	965	958	962	964	969	973	973	973	973	974	972	973	976	971		
20	916	920	925	924	933	934	938	941	944	943	948	950	949	949	946	944	942		
25	863	871	871	880	891	895	898	901	906	906	907	910	911	908	908	900	899		
30	796	805	812	822	832	839	844	849	853	854	859	857	852	854	847	843	836		
35	715	723	730	738	744	756	765	773	779	783	781	781	780	773	770	766	760		
40	620	628	634	642	656	664	667	668	669	672	678	682	683	676	669	668	663		
45	520	529	539	552	560	566	568	568	568	572	574	577	578	575	566	559	555		
50	423	433	445	455	461	456	449	447	450	453	458	465	471	469	461	451	445		
55	328	334	343	348	344	334	331	331	334	337	338	342	350	359	353	345	341		
60	238	237	238	237	235	232	233	239	243	242	238	237	236	246	250	248	250		
65	170	161	156	154	155	157	165	176	183	177	167	161	157	162	164	170	180		
70	128	117	112	108	109	115	124	137	145	136	125	119	113	115	117	122	133		
75	101	91.7	90.1	87.0	87.8	92.7	95.2	106	113	106	99.7	98.5	90.9	92.5	92.7	96.9	103		
80	76.8	68.0	66.1	63.5	62.7	66.3	67.3	74.5	76.8	77.6	72.7	74.0	67.5	67.7	66.4	71.7	77.6		
85	42.8	38.0	32.1	35.0	32.5	30.9	32.8	38.1	37.2	40.4	34.5	35.0	34.4	34.2	32.9	40.3	41.8		
90	0.65	0.71	0.62	0.56	0.75	0.55	0.62	0.91	0.69	1.18	0.71	0.56	0.78	0.52	0.94	0.66	0.71		
95	0.78	0.64	0.54	0.50	0.39	0.29	0.22	0.19	0.18	0.24	0.27	0.37	0.48	0.56	0.71	0.69	0.79		
100	0.86	0.63	0.48	0.54	0.42	0.31	0.25	0.22	0.20	0.26	0.30	0.40	0.53	0.60	0.61	0.73	0.76		
105	0.79	0.71	0.50	0.50	0.42	0.33	0.27	0.24	0.22	0.27	0.34	0.41	0.48	0.53	0.65	0.79	0.83		
110	0.76	0.68	0.53	0.48	0.39	0.32	0.27	0.23	0.23	0.27	0.33	0.39	0.47	0.56	0.67	0.82	0.85		
115	0.69	0.66	0.50	0.45	0.37	0.31	0.28	0.23	0.23	0.25	0.32	0.39	0.46	0.51	0.64	0.75	0.77		
120	0.64	0.60	0.47	0.43	0.37	0.31	0.28	0.22	0.22	0.24	0.31	0.37	0.43	0.48	0.61	0.64	0.70		
125	0.59	0.47	0.46	0.42	0.36	0.32	0.28	0.23	0.22	0.24	0.30	0.36	0.42	0.44	0.51	0.61	0.59		
130	0.55	0.54	0.48	0.40	0.37	0.35	0.30	0.26	0.26	0.27	0.33	0.38	0.40	0.46	0.50	0.48	0.47		
135	0.57	0.49	0.49	0.48	0.41	0.39	0.34	0.32	0.31	0.32	0.36	0.37	0.46	0.51	0.50	0.54	0.51		
140	0.57	0.51	0.51	0.50	0.44	0.42	0.38	0.37	0.36	0.36	0.37	0.40	0.48	0.52	0.46	0.58	0.50		
145	0.60	0.60	0.51	0.48	0.49	0.45	0.42	0.42	0.41	0.39	0.41	0.42	0.49	0.48	0.54	0.58	0.50		
150	0.59	0.54	0.52	0.52	0.51	0.47	0.46	0.45	0.42	0.43	0.44	0.46	0.46	0.48	0.56	0.60	0.55		
155	0.56	0.59	0.58	0.55	0.50	0.48	0.47	0.46	0.45	0.46	0.45	0.46	0.48	0.51	0.51	0.54	0.54		
160	0.59	0.59	0.58	0.56	0.53	0.51	0.50	0.49	0.47	0.48	0.48	0.49	0.51	0.55	0.57	0.59	0.55		
165	0.56	0.57	0.56	0.55	0.55	0.54	0.53	0.50	0.49	0.49	0.49	0.49	0.51	0.53	0.54	0.55	0.55		
170	0.57	0.57	0.59	0.59	0.58	0.57	0.56	0.53	0.52	0.53	0.53	0.51	0.51	0.54	0.56	0.56	0.55		
175	0.61	0.62	0.61	0.61	0.60	0.60	0.59	0.57	0.56	0.56	0.57	0.55	0.55	0.58	0.58	0.58	0.58		
180	0.60	0.60	0.60	0.60	0.59	0.58	0.58	0.56	0.56	0.56	0.55	0.54	0.55	0.57	0.58	0.57	0.58		

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
Integrate Sphere system	2M	HZTE015-01	Sep. 18, 2014	Sep. 17, 2015
Digital Power Meter	WT210	HZTE008-01	Sep. 18, 2014	Sep. 17, 2015
AC Power Supply	PCR 500L	HZTE001-07	Sep. 18, 2014	Sep. 17, 2015
DC Power Supply	6154	HZTE004-04	Sep. 18, 2014	Sep. 17, 2015
Temperature and humidity recorder	JR900	HZTE018-01	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.

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.

The uncertainty of integrating sphere system reported in this document is expended uncertainty is 1.06% 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 expanded uncertainty is 1.94% with a coverage factor $k=2$.

Color Characteristics Measurements

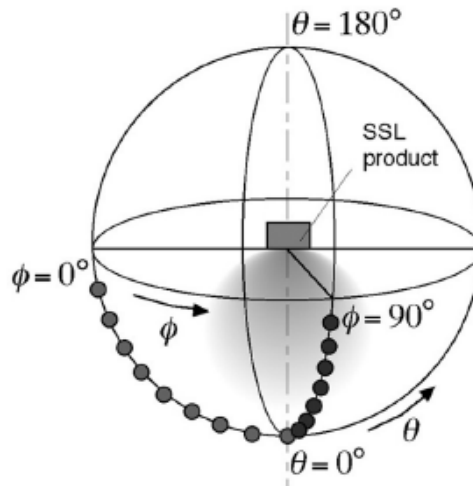
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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