



LM-79-08 Test Report

for

IKIO LED LIGHTING

8470 Allison Pointe Blvd, Suite 128
Indianapolis, IN 46250

1,

LED Corn Bulb Lamp Premium

Model: IK-CRA-L120-0100-50

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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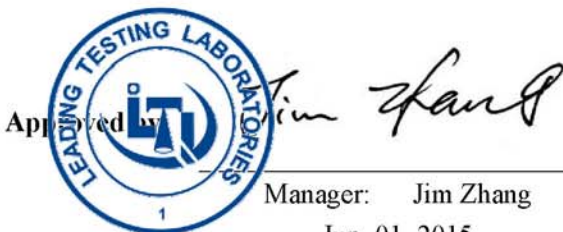
Report No.: HZ15050112t

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

Review by:

April Zou

Engineer: April Zou
Jun. 01, 2015



Approved by

Manager: Jim Zhang
Jun. 01, 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: **IK-CRA-L120-0100-50**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
129.0	12660.0	98.15	0.9929
CCT (K)	CRI	Stabilization Time (Light & Power)	
5343	82.6	65	

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 08, 2015
Date of Test	: May 15, 2015 to May 19, 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 Photos



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: LED Corn Bulb Lamp Premium
Model	: IK-CRA-L120-0100-50
Electrical Ratings	: 100-277Vac, 50-60Hz, 100W
Product Description	: E39 base, 5000K, Non-dimmable Model of the LED light source: 5630 2 nd Generation Manufacturer of the LED light source: Samsung Quantity of LED light source: 280pcs
Manufacturer	: IKIO LED LIGHTING
Address	: 8470 Allison Pointe Blvd, Suite 128 Indianapolis, IN 46250

TEST RESULTS

Test ambient temperature was 24.8°C.

Base orientation was Base down. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 65 minutes, and the total operating time including stabilization was 70 minutes.

Sphere-Spectroradiometer Method

Parameter	Result			Special Color Rendering Indices	
Test Voltage (V)	120.0	100.0	277.0	R1	80.4
Voltage frequency (Hz)	60	60	60	R2	86.5
Test Current (A)	0.824	0.994	0.398	R3	91.5
Power Factor	0.9929	0.9960	0.8816	R4	83.3
Test Power (W)	98.15	98.96	97.10	R5	82
THD A%	7.79	6.82	12.15	R6	82.3
Luminous Efficacy (lm/W)	129.0			R7	86.7
Total Luminous Flux (lm)	12660.0			R8	68
Color Rendering Index (CRI)	82.6			R9	5.9
R9	5.9			R10	68.7
Correlated Color Temperature (CCT) (K)	5343			R11	83.1
Chromaticity Chroma x	0.3363			R12	67.3
Chromaticity Chroma y	0.3510			R13	81.6
Chromaticity Chroma u	0.2057			R14	95.4
Chromaticity Chroma v	0.3220				
Duv	0.0030				
Chromaticity Chroma u'	0.2057				
Chromaticity Chroma v'	0.4830				

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 25.2°C.

The photometric distance is 2.475m.

Luminous data was taken at 0.5°vertical intervals and 22.5°horizontal intervals.

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.826
Power Factor	0.9931
Test Power (W)	98.48
Luminous Efficacy (lm/W)	127.0
Total Luminous Flux (lm)	12508.1
Beam Angle (°)	290.3
Center Beam Candle Power (cd)	657
Maximum Beam Candle Power (cd)	1312(At: C=0.0, Gamma=64.5)
Spacing Criteria	2.33 (0°-180°)/ 2.34(90°-270°)
Zonal Lumens in the 0°-60°Zone	26.53%
Zonal Lumens in the 60°-90°Zone	31.04%
Zonal Lumens in the 90°-120°Zone	27.97%
Zonal Lumens in the 120°-180°Zone	14.46%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

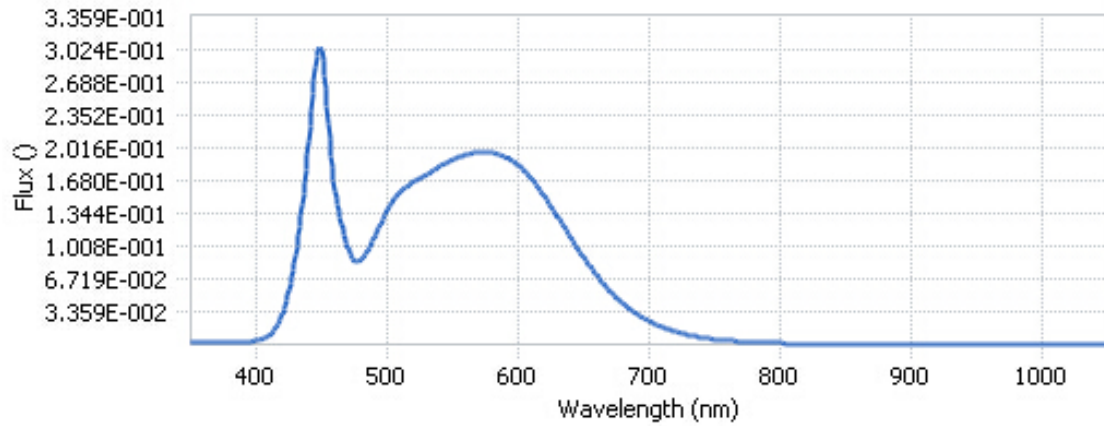
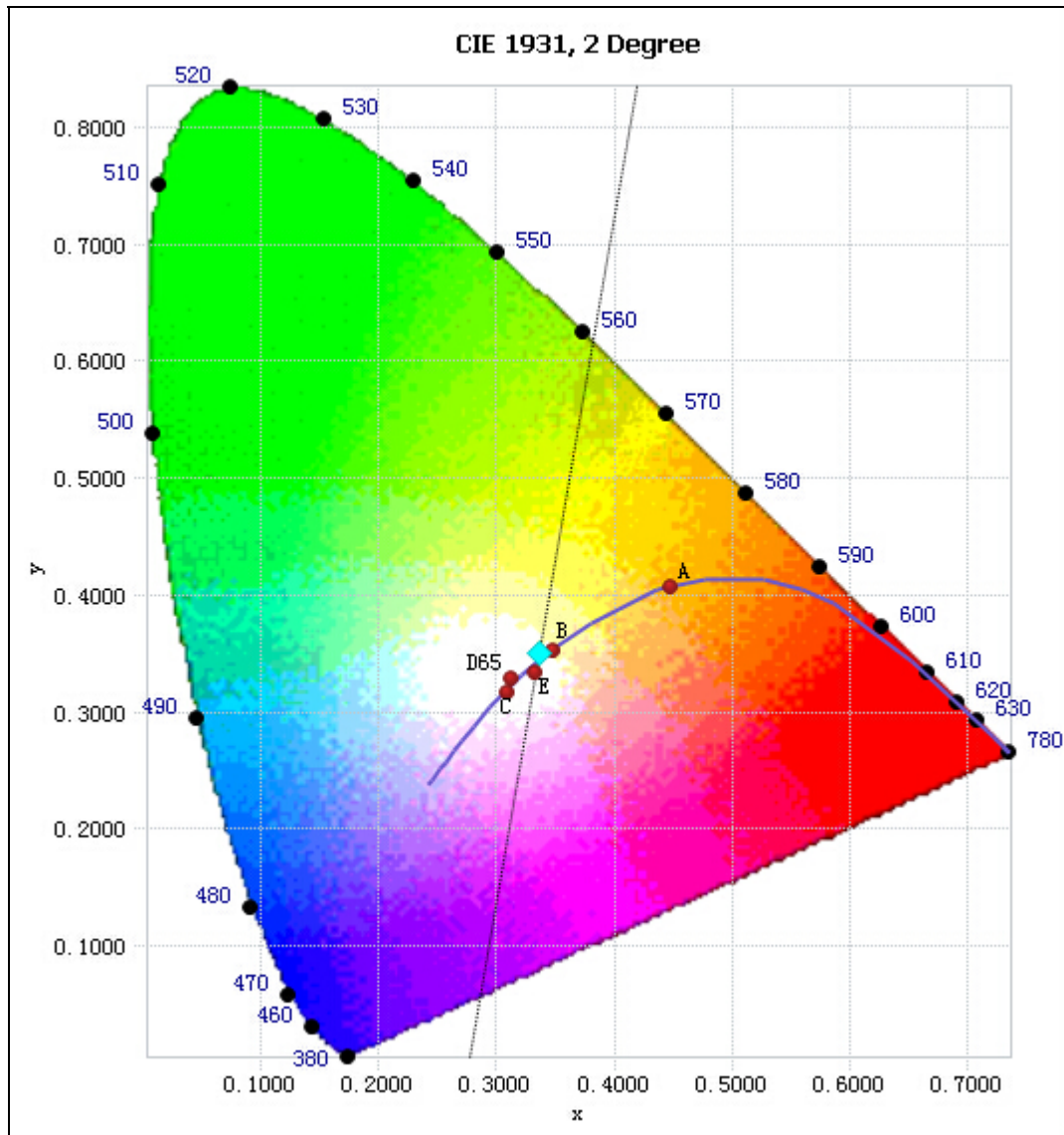


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.39E-03	485	9.68E-02	590	1.92E-01	695	2.75E-02
385	2.33E-03	490	1.09E-01	595	1.89E-01	700	2.37E-02
390	2.47E-03	495	1.24E-01	600	1.84E-01	705	2.05E-02
395	2.91E-03	500	1.38E-01	605	1.77E-01	710	1.75E-02
400	3.87E-03	505	1.49E-01	610	1.70E-01	715	1.52E-02
405	5.71E-03	510	1.56E-01	615	1.62E-01	720	1.31E-02
410	9.52E-03	515	1.62E-01	620	1.52E-01	725	1.13E-02
415	1.75E-02	520	1.67E-01	625	1.42E-01	730	9.67E-03
420	3.17E-02	525	1.71E-01	630	1.31E-01	735	8.31E-03
425	5.69E-02	530	1.74E-01	635	1.20E-01	740	7.16E-03
430	9.27E-02	535	1.79E-01	640	1.09E-01	745	6.20E-03
435	1.43E-01	540	1.83E-01	645	9.92E-02	750	5.28E-03
440	2.08E-01	545	1.86E-01	650	8.91E-02	755	4.57E-03
445	2.85E-01	550	1.89E-01	655	7.97E-02	760	3.94E-03
450	3.03E-01	555	1.92E-01	660	7.08E-02	765	3.42E-03
455	2.26E-01	560	1.95E-01	665	6.24E-02	770	2.97E-03
460	1.58E-01	565	1.96E-01	670	5.48E-02	775	2.54E-03
465	1.23E-01	570	1.97E-01	675	4.80E-02	780	2.21E-03
470	9.84E-02	575	1.97E-01	680	4.19E-02		
475	8.60E-02	580	1.97E-01	685	3.66E-02		
480	8.77E-02	585	1.95E-01	690	3.18E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3363, 0.3510)

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

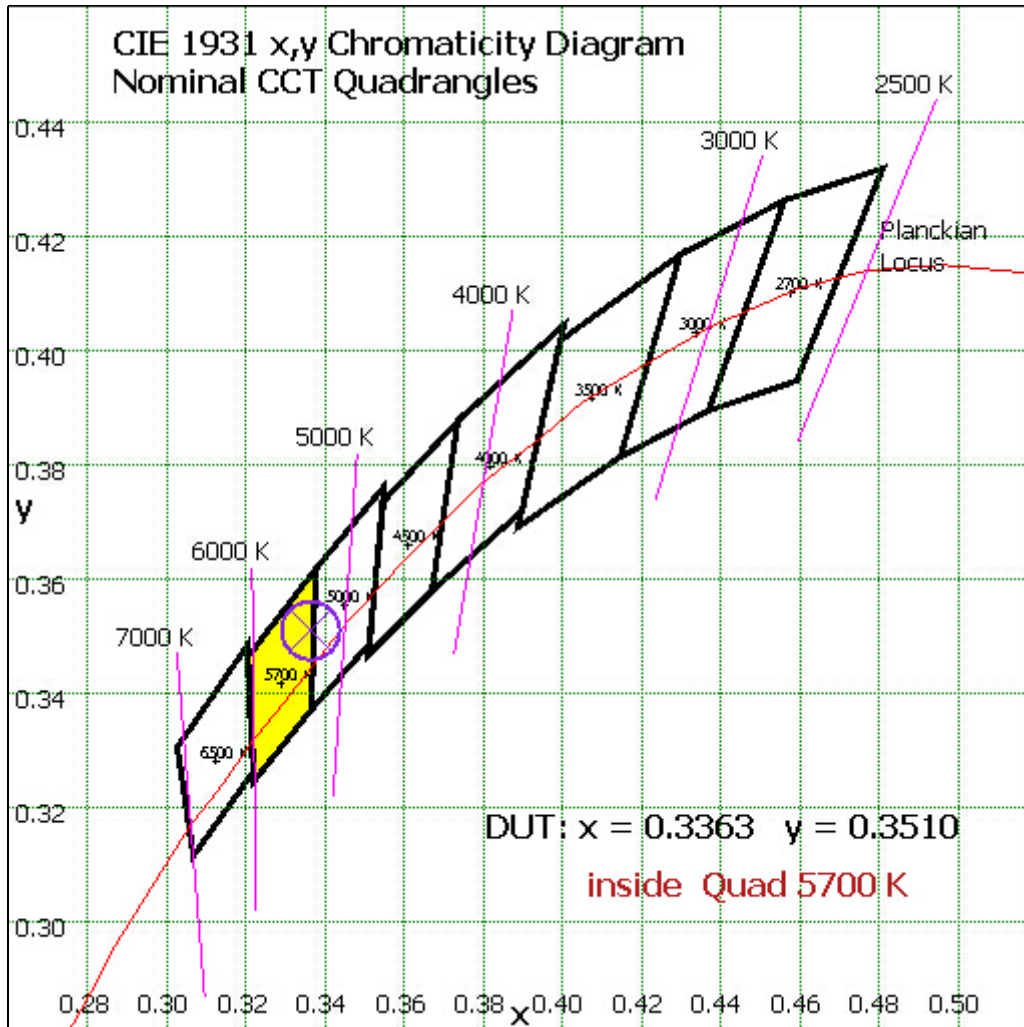


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

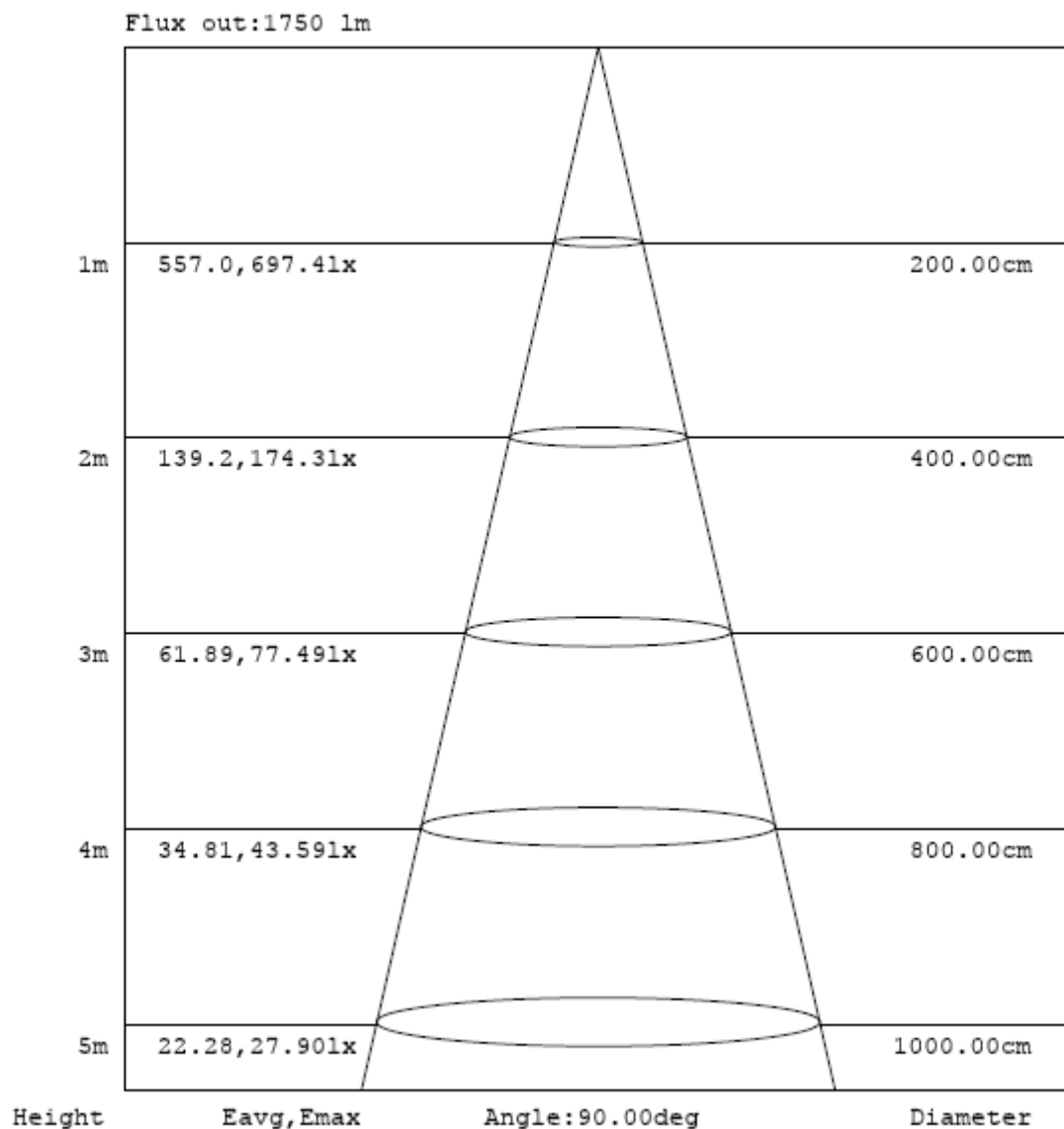
Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total	$\gamma(^{\circ})$	Lumens	% Total
0~ 5	15.77	0.13%	90~95	654.708	5.23%
5~10	47.856	0.38%	95~100	642.196	5.13%
10~15	83.283	0.67%	100~105	617.684	4.94%
15~20	125.677	1.00%	105~110	578.392	4.62%
20~25	176.1	1.41%	110~115	529.086	4.23%
25~30	233.121	1.86%	115~120	476.484	3.81%
30~35	294.146	2.35%	120~125	421.662	3.37%
35~40	356.418	2.85%	125~130	364.009	2.91%
40~45	417.489	3.34%	130~135	303.287	2.42%
45~50	474.068	3.79%	135~140	240.869	1.93%
50~55	524.558	4.19%	140~145	182.449	1.46%
55~60	569.536	4.55%	145~150	130.24	1.04%
60~65	608.817	4.87%	150~155	84.746	0.68%
65~70	637.009	5.09%	155~160	48.946	0.39%
70~75	654.439	5.23%	160~165	22.931	0.18%
75~80	661.239	5.29%	165~170	7.791	0.06%
80~85	661	5.28%	170~175	1.535	0.01%
85~90	660.498	5.28%	175~180	0.104	0.00%

$\gamma(^{\circ})$	Lumens	% Total
0-135	11788.532	94.25%
135-180	719.611	5.75%
0-180	12508.1	100%

Table 5: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method



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

Chart 4: Beam Angle

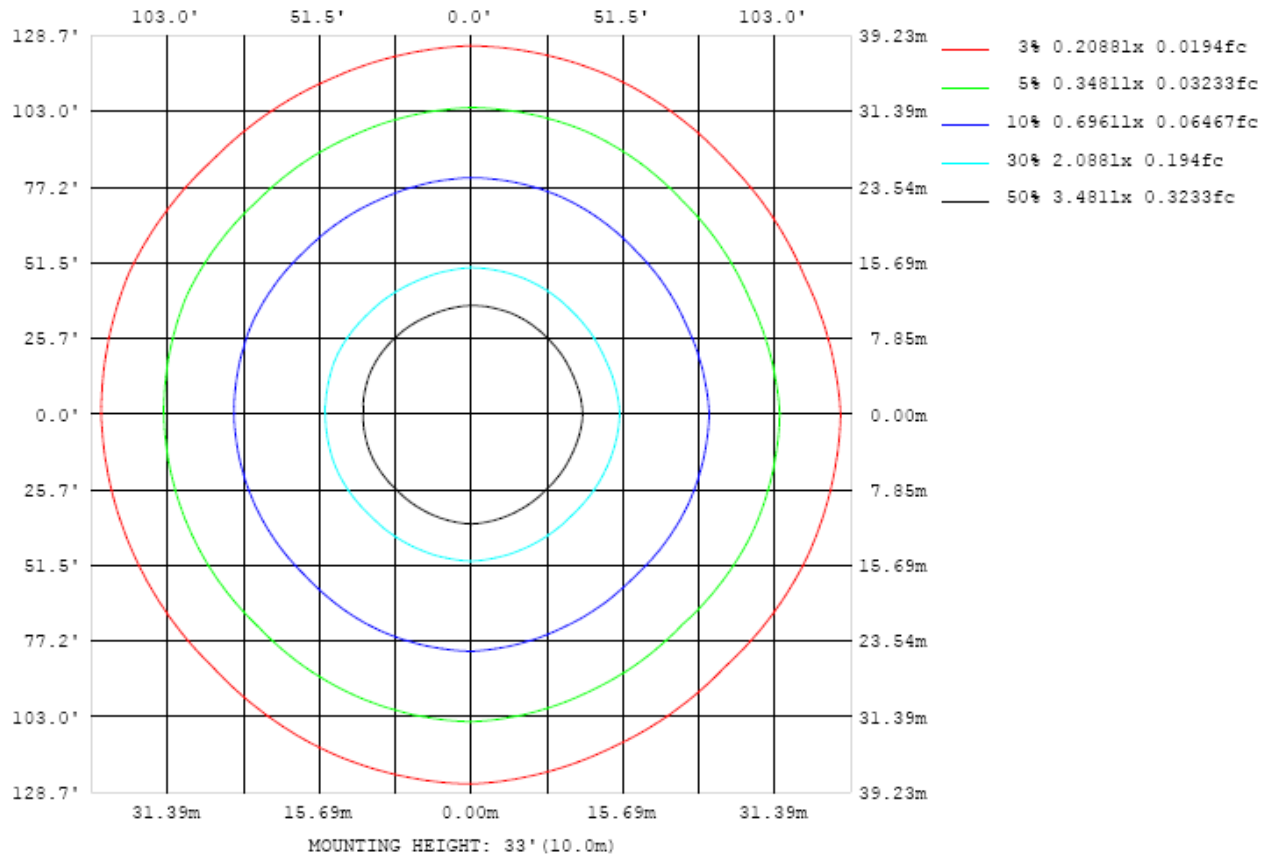


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

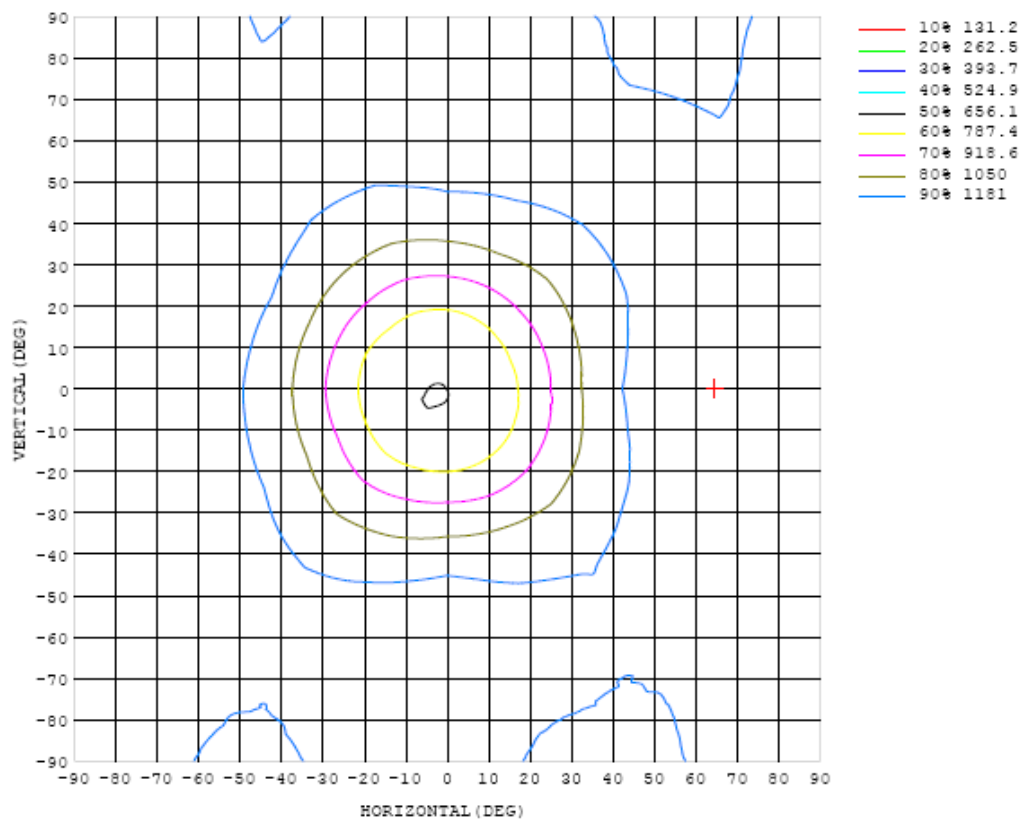


Chart 6: Isocandela Plot

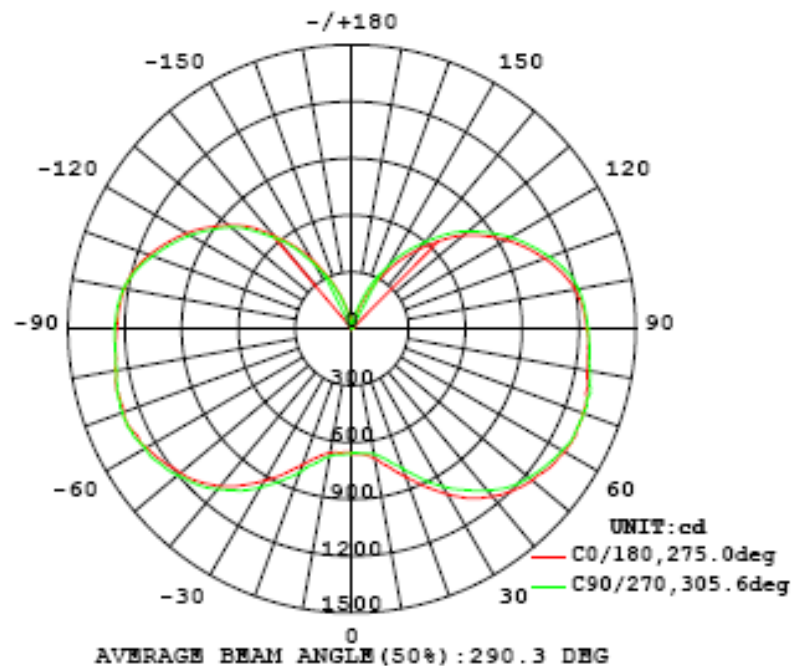


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) γ (DEG)	0	23	45	68	90	113	135	158	180	203	225	248	270	293	315	338			
0	657	657	657	657	657	657	657	657	657	657	657	657	657	657	657	657			
5	665	664	662	661	660	658	655	654	656	660	662	664	666	668	668	668			
10	695	690	683	679	672	666	663	663	665	665	670	673	684	690	696	701			
15	754	747	740	729	714	710	703	703	701	703	713	724	732	745	759	766			
20	832	822	807	794	785	781	767	770	764	769	787	790	805	821	834	841			
25	918	902	887	876	873	860	846	854	843	851	871	869	884	899	914	921			
30	1008	979	960	955	961	938	922	938	926	938	946	947	966	978	989	1001			
35	1092	1052	1030	1035	1038	1007	993	1018	1008	1022	1024	1022	1042	1055	1049	1069			
40	1154	1110	1084	1102	1114	1080	1056	1084	1084	1098	1087	1080	1104	1112	1104	1116			
45	1206	1158	1134	1154	1179	1143	1120	1144	1142	1159	1146	1136	1161	1158	1147	1162			
50	1244	1191	1161	1186	1222	1187	1157	1188	1183	1204	1180	1171	1203	1198	1185	1196			
55	1276	1220	1183	1214	1255	1214	1189	1221	1221	1236	1198	1199	1239	1227	1206	1212			
60	1299	1251	1204	1231	1283	1243	1205	1238	1254	1267	1217	1220	1262	1261	1221	1236			
65	1307	1263	1206	1241	1299	1264	1216	1253	1278	1290	1234	1241	1285	1273	1228	1243			
70	1300	1259	1199	1230	1300	1265	1215	1255	1285	1295	1237	1245	1292	1264	1219	1230			
75	1282	1246	1183	1222	1306	1266	1216	1248	1285	1288	1222	1237	1284	1259	1198	1201			
80	1264	1231	1156	1200	1278	1254	1182	1221	1269	1269	1202	1219	1266	1233	1174	1182			
85	1252	1225	1143	1177	1261	1234	1164	1208	1254	1253	1183	1203	1256	1225	1163	1170			
90	1241	1219	1134	1165	1248	1222	1149	1195	1243	1241	1173	1199	1254	1217	1156	1160			
95	1227	1207	1123	1153	1236	1212	1137	1184	1235	1230	1165	1192	1245	1203	1145	1147			
100	1198	1184	1105	1133	1216	1197	1122	1171	1222	1210	1150	1177	1226	1178	1123	1124			
105	1149	1141	1068	1096	1174	1163	1095	1144	1192	1173	1120	1142	1183	1133	1082	1081			
110	1085	1081	1012	1038	1112	1110	1047	1096	1141	1114	1068	1086	1123	1071	1023	1022			
115	1016	1012	951	973	1041	1046	987	1035	1077	1046	1007	1024	1057	1004	962	958			
120	939	940	890	910	968	980	928	974	1010	976	948	961	989	938	901	894			
125	856	864	827	845	885	910	865	912	933	905	885	894	913	864	834	824			
130	769	776	747	768	801	831	792	838	852	824	809	815	835	781	748	739			
135	659	680	661	681	706	741	704	752	760	731	720	723	732	681	657	645			
140	547	570	565	581	596	633	607	649	642	625	620	618	625	572	556	544			
145	440	464	464	482	495	532	504	542	534	524	516	520	514	474	456	447			
150	325	351	360	378	383	421	405	437	423	423	416	411	390	367	352	341			
155	223	242	262	278	281	309	295	324	307	313	315	312	291	268	254	239			
160	132	143	159	177	181	204	197	219	205	222	208	207	192	166	158	146			
165	60.5	67.2	79.4	93.8	98.5	111	112	125	116	118	113	115	101	84.1	73.8	68.4			
170	18.9	22.3	28.6	34.4	39.6	44.3	47.2	49.4	48.8	49.1	46.0	43.2	36.7	28.7	23.3	20.9			
175	1.72	3.28	5.39	7.72	9.95	12.0	12.8	13.3	12.8	13.4	11.4	9.24	7.15	4.91	2.71	1.74			
180	1.05	1.06	1.06	1.06	1.06	1.06	1.03	0.99	1.06	1.05	1.06	1.06	1.06	1.06	1.07	1.07			

Table 6: 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 7: 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 BR30s) 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 1.39% 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 BR30s) 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 1.8% with a coverage factor $k=2$.

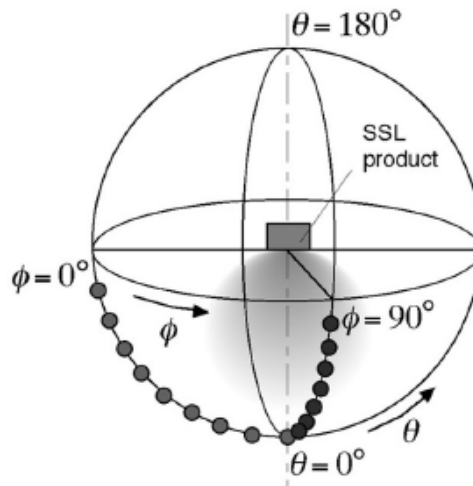
Color Characteristics Measurements

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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