



LM-79-08 Test Report

for

IKIO LED LIGHTING

8470 Allison Pointe Blvd, Suite 128
Indianapolis, IN 46250

LED LIGHT

Model: IK-CRA-L120-0027-E(X)3950

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15030025f

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

Review by:

Engineer: April Zou
Jun. 04, 2015

Approved by 


Manager: Jim Zhang
Jun. 04, 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-L120-0027-E(X)3950

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
128.6	3488.0	27.12	0.9863
CCT (K)	CRI	Stabilization Time (Light & Power)	
5296	82.0	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	: Mar. 25, 2015
Date of Test	: Mar. 27, 2015 to Mar. 30, 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



E26 base



E39 base

Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: LED Corn Bulb Lamp Premium
Model	: IK-CRA-L120-0027-E(X)3950
Electrical Ratings	: 100-277Vac, 50-60Hz, 27W
Product Description	: E26 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: 81pcs
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 60 minutes, and the total operating time including stabilization was 65 minutes.

Sphere-Spectroradiometer Method

Parameter	Result			Special Color Rendering Indices	
Test Voltage (V)	120.0	100.0	277.0	R1	79.7
Voltage frequency (Hz)	60	60	60	R2	85.7
Test Current (A)	0.229	0.278	0.112	R3	91
Power Factor	0.9863	0.9872	0.8692	R4	83
Test Power (W)	27.12	27.46	27.02	R5	81.4
THD A%	13.20	13.70	14.50	R6	81.5
Luminous Efficacy (lm/W)	128.6			R7	86.4
Total Luminous Flux (lm)	3488.0			R8	67.6
Color Rendering Index (CRI)	82.0			R9	4.1
R9	4.1			R10	67.2
Correlated Color Temperature (CCT) (K)	5296			R11	83.1
Chromaticity Chroma x	0.3375			R12	66.8
Chromaticity Chroma y	0.3540			R13	80.8
Chromaticity Chroma u	0.2054			R14	95.2
Chromaticity Chroma v	0.3231				
Duv	0.0039				
Chromaticity Chroma u'	0.2054				
Chromaticity Chroma v'	0.4847				

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 24.9°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)	0.228
Power Factor	0.9858
Test Power (W)	26.92
Luminous Efficacy (lm/W)	129.3
Total Luminous Flux (lm)	3482.0
Beam Angle (°)	316.9
Center Beam Candle Power (cd)	142
Maximum Beam Candle Power (cd)	346.0 (At: C=112.5, Gamma=70.0)
Spacing Criteria	2.64 (0°-180°)/ 2.65 (90°-270°)
Zonal Lumens in the 0°-60°Zone	24.75%
Zonal Lumens in the 60°-90°Zone	30.35%
Zonal Lumens in the 90°-120°Zone	28.79%
Zonal Lumens in the 120°-180°Zone	16.11%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

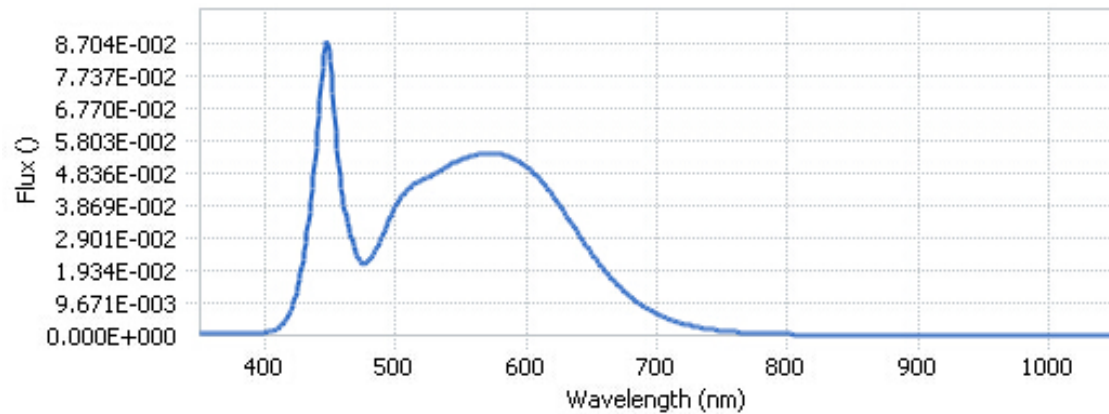
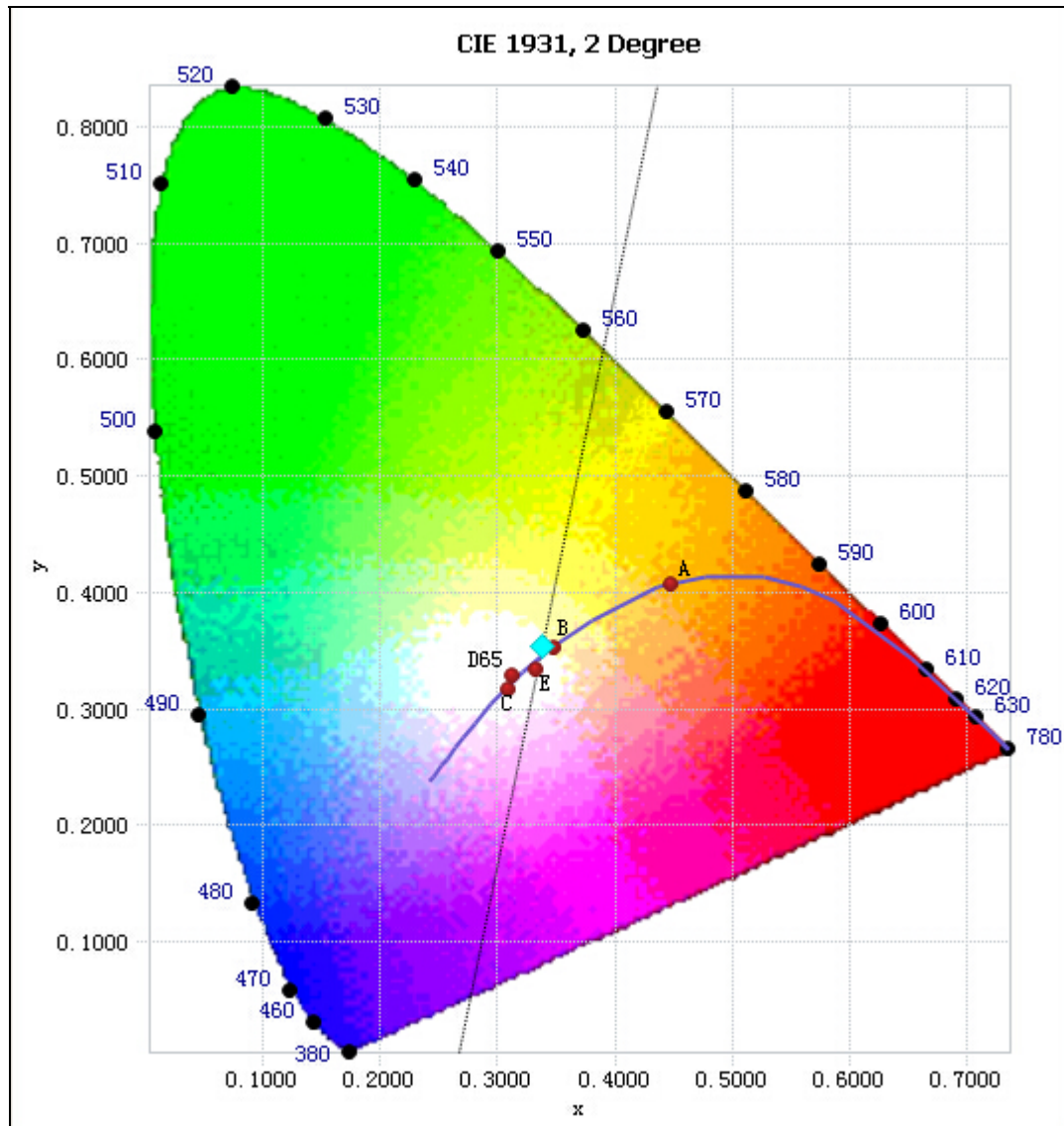


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	5.98E-04	485	2.58E-02	590	5.27E-02	695	7.40E-03
385	5.76E-04	490	3.00E-02	595	5.18E-02	700	6.39E-03
390	6.69E-04	495	3.47E-02	600	5.03E-02	705	5.50E-03
395	7.58E-04	500	3.87E-02	605	4.86E-02	710	4.72E-03
400	9.25E-04	505	4.17E-02	610	4.67E-02	715	4.05E-03
405	1.32E-03	510	4.38E-02	615	4.44E-02	720	3.48E-03
410	2.24E-03	515	4.52E-02	620	4.19E-02	725	3.01E-03
415	4.19E-03	520	4.64E-02	625	3.90E-02	730	2.55E-03
420	8.02E-03	525	4.73E-02	630	3.61E-02	735	2.18E-03
425	1.47E-02	530	4.82E-02	635	3.32E-02	740	1.88E-03
430	2.50E-02	535	4.95E-02	640	3.03E-02	745	1.61E-03
435	4.01E-02	540	5.06E-02	645	2.73E-02	750	1.39E-03
440	6.10E-02	545	5.17E-02	650	2.45E-02	755	1.18E-03
445	8.39E-02	550	5.24E-02	655	2.19E-02	760	1.03E-03
450	8.18E-02	555	5.31E-02	660	1.94E-02	765	8.81E-04
455	5.56E-02	560	5.36E-02	665	1.71E-02	770	7.63E-04
460	3.86E-02	565	5.41E-02	670	1.50E-02	775	6.65E-04
465	3.05E-02	570	5.41E-02	675	1.31E-02	780	5.69E-04
470	2.39E-02	575	5.42E-02	680	1.14E-02		
475	2.13E-02	580	5.39E-02	685	9.94E-03		
480	2.26E-02	585	5.34E-02	690	8.61E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3375, 0.3540)

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

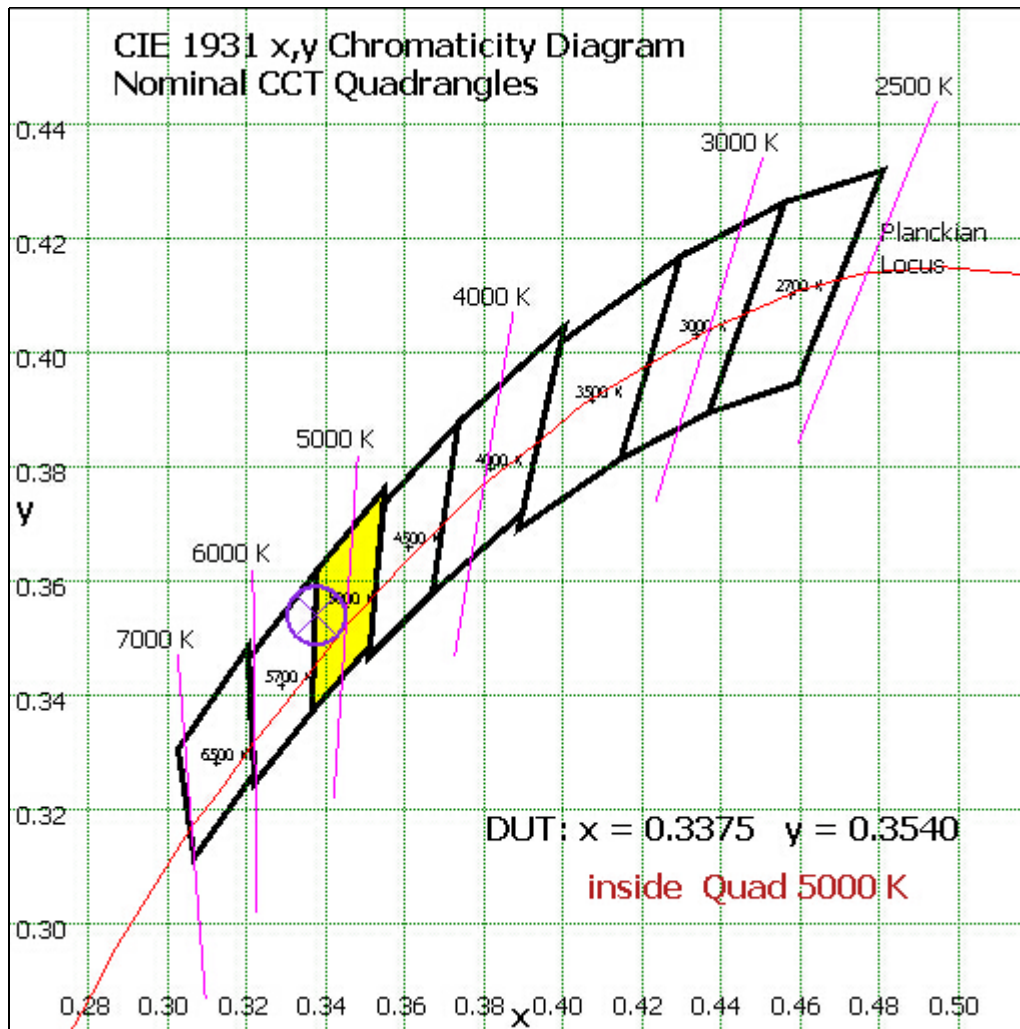


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

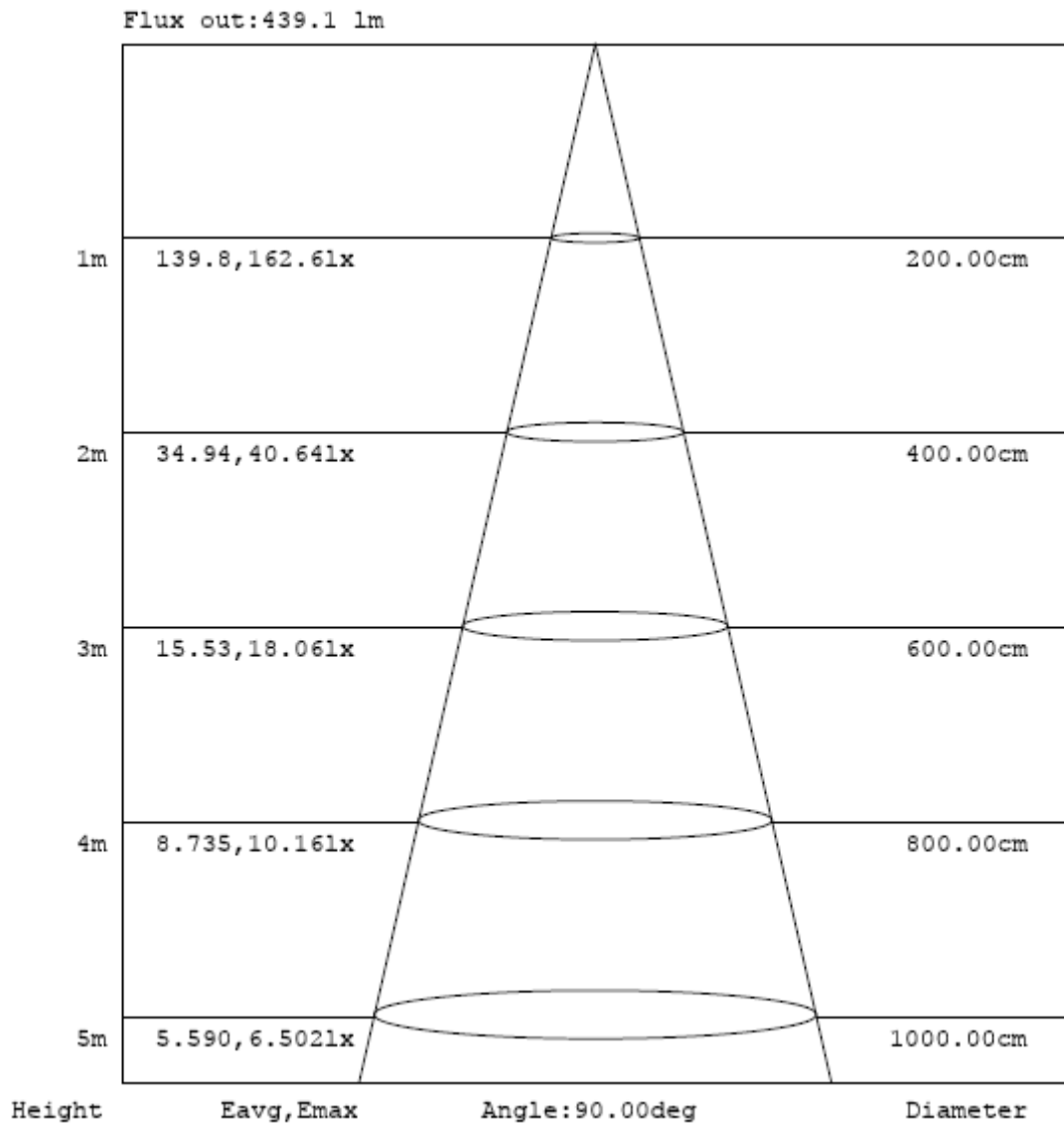
Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total	$\gamma(^{\circ})$	Lumens	% Total
0~ 5	3.407	0.10%	90~95	183.382	5.27%
5~10	10.418	0.30%	95~100	180.205	5.18%
10~15	18.616	0.53%	100~105	174.539	5.01%
15~20	29.209	0.84%	105~110	166.242	4.77%
20~25	42.267	1.21%	110~115	155.529	4.47%
25~30	57.325	1.65%	115~120	142.668	4.10%
30~35	74.441	2.14%	120~125	127.955	3.67%
35~40	92.892	2.67%	125~130	111.607	3.21%
40~45	110.484	3.17%	130~135	93.582	2.69%
45~50	127.112	3.65%	135~140	74.729	2.15%
50~55	141.717	4.07%	140~145	56.603	1.63%
55~60	153.948	4.42%	145~150	41.359	1.19%
60~65	163.982	4.71%	150~155	27.88	0.80%
65~70	171.401	4.92%	155~160	16.273	0.47%
70~75	176.565	5.07%	160~165	7.671	0.22%
75~80	179.783	5.16%	165~170	2.664	0.08%
80~85	181.298	5.21%	170~175	0.508	0.01%
85~90	183.655	5.27%	175~180	0.036	0.00%

$\gamma(^{\circ})$	Lumens	% Total
0-135	3254.229	93.46%
135-180	227.723	6.54%
0-180	3482.0	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

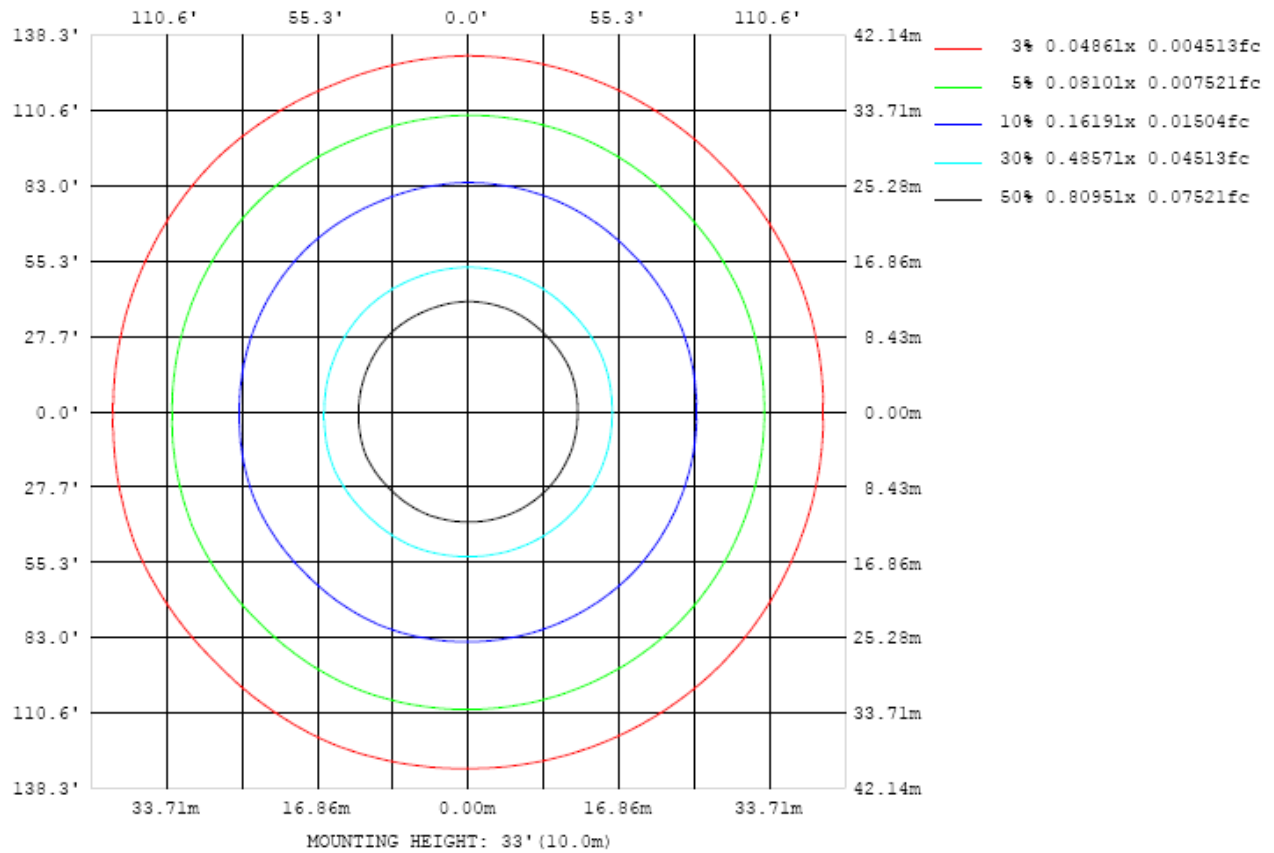


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

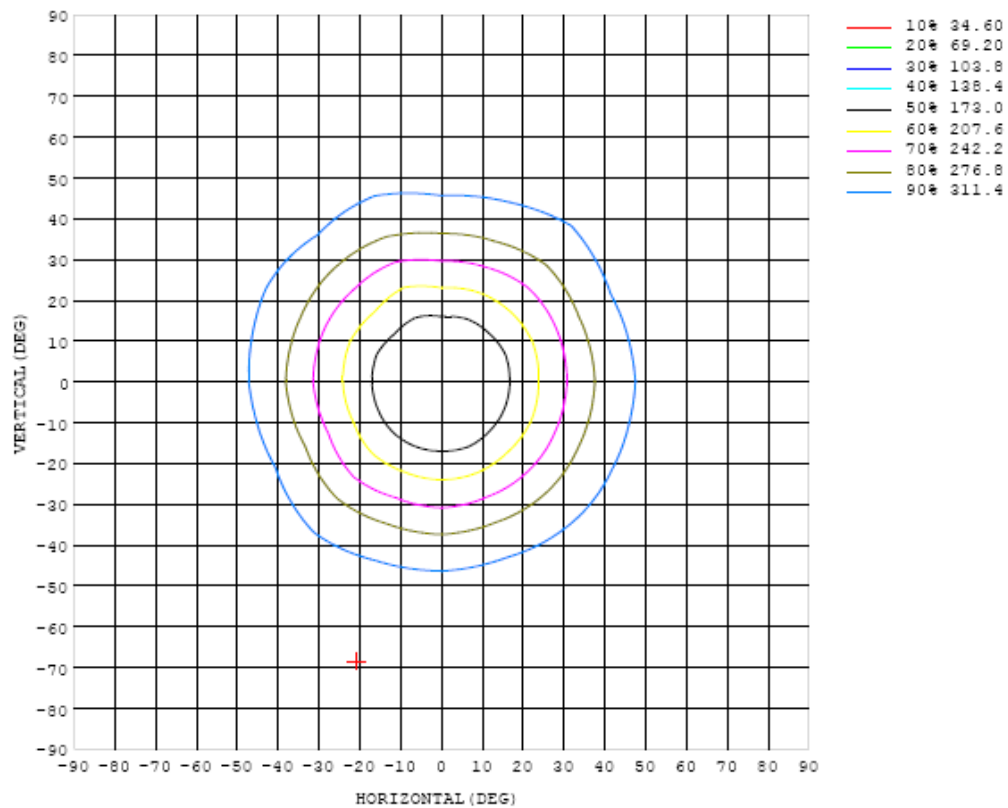


Chart 6: Isocandela Plot

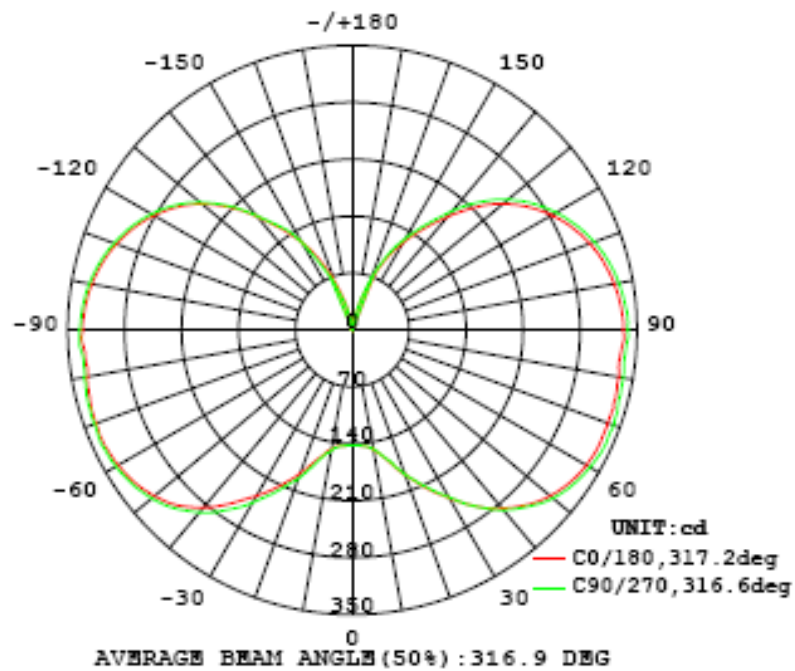


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	23	45	68	90	113	135	158	180	203	225	248	270	293	315	338			
0	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142			
5	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143	143			
10	150	149	149	148	148	148	149	149	149	149	150	149	150	149	150	149			
15	165	165	165	163	165	164	165	165	164	164	167	164	168	166	166	165			
20	189	189	191	189	189	188	188	190	187	189	190	187	194	190	190	188			
25	214	213	215	214	212	214	211	215	212	210	214	209	218	215	213	212			
30	239	241	242	242	237	240	236	241	235	236	238	235	245	242	237	238			
35	265	268	268	268	265	267	262	269	260	263	264	264	270	269	265	268			
40	286	290	291	293	289	290	287	293	285	287	289	286	293	290	286	291			
45	304	308	309	310	307	307	305	312	305	303	309	303	310	307	303	309			
50	317	322	324	325	322	323	320	327	318	318	322	318	322	321	316	323			
55	327	330	333	333	331	334	329	336	327	328	331	327	331	329	324	331			
60	332	335	339	339	338	341	335	342	333	333	337	331	336	333	329	336			
65	335	338	342	341	341	344	338	344	336	337	340	334	339	337	332	338			
70	334	336	342	341	342	346	338	345	336	338	340	333	337	336	331	337			
75	334	335	341	340	339	344	336	343	334	336	339	331	337	334	332	337			
80	333	334	339	339	338	342	334	340	331	333	336	328	335	332	329	333			
85	331	332	338	336	337	340	332	339	330	333	336	328	334	332	328	333			
90	333	335	339	339	339	342	334	341	332	335	337	329	335	335	331	335			
95	331	333	338	337	337	341	332	338	330	333	334	327	333	332	328	333			
100	327	328	334	333	333	336	328	334	325	329	330	323	329	328	324	329			
105	320	322	327	326	326	329	322	327	318	321	323	316	321	321	317	323			
110	311	313	318	317	317	320	312	317	309	312	313	306	312	311	308	313			
115	298	301	306	305	304	307	301	304	297	299	300	294	300	299	296	301			
120	283	286	290	290	289	291	286	289	282	283	285	280	285	284	280	286			
125	264	268	272	272	271	273	267	271	264	264	266	262	267	265	262	268			
130	242	246	250	251	250	250	245	249	241	241	243	239	244	243	241	245			
135	213	219	223	224	223	222	217	220	214	212	215	211	216	214	213	218			
140	182	189	191	192	191	189	184	187	182	181	183	180	184	182	179	188			
145	152	155	159	158	159	156	153	155	152	151	154	152	156	152	149	159			
150	124	126	130	129	130	127	124	125	124	123	127	123	125	120	123	129			
155	94.7	94.6	99.2	98.2	100	96.5	95.1	94.2	94.5	92.2	87.8	90.7	84.4	88.9	90.2	93.5			
160	60.6	62.6	66.0	64.9	66.1	64.2	63.8	61.8	62.7	59.2	52.6	57.7	52.3	58.6	53.6	61.1			
165	32.8	33.0	35.4	34.9	34.9	34.4	35.4	33.9	34.4	32.5	30.2	31.4	29.0	32.3	29.1	34.2			
170	12.0	12.4	12.5	12.9	12.0	12.8	12.4	12.8	13.4	13.4	12.3	12.2	10.8	11.7	11.1	11.9			
175	2.66	2.75	2.90	3.01	3.19	3.18	3.17	3.32	3.40	3.44	3.19	2.83	1.65	1.59	1.91	2.08			
180	0.18	0.01	0.12	0.00	0.00	0.00	0.12	0.15	0.31	0.31	0.31	0.31	0.31	0.32	0.32	0.32			

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 $k=2$.

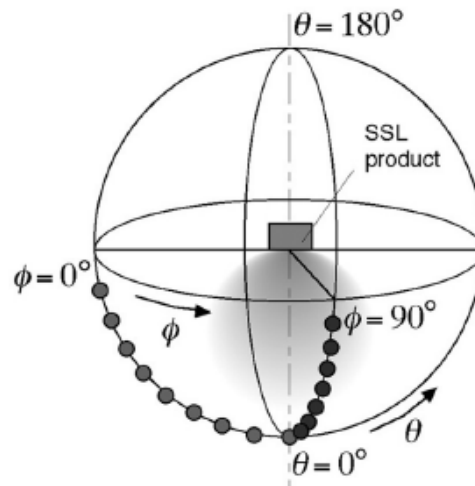
Color Characteristics Measurements

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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