



LM-79-08 Test Report

for

P.Q.L., Inc.

2285 Ward Avenue / Simi Valley, CA 93065

T8 LED Tube in 2x4 troffer

Model: 9059X, 90593

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15100048n

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

Review by:

Engineer: April Zou
Nov. 03, 2015

Approved by:



Manager: Jim Zhang
Nov. 03, 2015

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Test Summary

Model	9059X, 90593
Luminous Efficacy (Lumens /Watt)	114.0
Total Luminous Flux (Lumens)	2942.9
Power (Watts)	25.82
Power Factor	0.9765
Stabilization Time (Light & Power)	60 mins
Note	3000K, Opal Lens

Table 1: Executive Data Summary

Test specifications:

Date of Receipt	: Oct. 28, 2015
Date of Test	: Nov. 02, 2015
Test item	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, 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



Sample view



Samples in Lithonia 2GT8 Lensed 2x4

Equipment Under Test (EUT)

Name	: T8 LED TUBE
Model	: 9059X, 90593
Electrical Ratings	: 120-277Vac, 50/60Hz, 12.5W
Product Description	: G13 base, fixed end caps, 3000K, 4 feet tube, Opal Lens Manufacturer of the LED light source: Everlight Electronics Co., LTD Model of the LED light source: 67-21S Series Quantity of the LED light source: 105pcs
Manufacturer	: P.Q.L., Inc.
Address	: 2285 Ward Avenue / Simi Valley, CA 93065

TEST RESULTS

Test ambient temperature was 24.8°C.

Test 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.

The photometric distance is 30 m.

Luminous data was taken at 0.5°vertical intervals and 10°horizontal intervals.

Parameter	T8L-IDFH13-1800-4ft-ABA 2 tubes In 2x4 troffer	
	Test Voltage (V)	120.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.220	0.104
Power Factor	0.9765	0.9107
Test Power (W)	25.82	26.32
Off state power	0	0
Luminous Efficacy (lm/W)	114.0	113.9
Total Luminous Flux (lm)	2942.9	2997.0
Center Beam Candle Power (cd)	1122	
Spacing Criteria	1.25 (0°)/ 1.30 (90°)	
Zonal Lumens in the 0°-60°Zone	83.08%	
Zonal Lumens in the 60°-90°Zone	16.80%	
Zonal Lumens in the 90°-120°Zone	0.05%	
Zonal Lumens in the 120°-180°Zone	0.07%	

Table 2: Test data per Goniophotometer Method

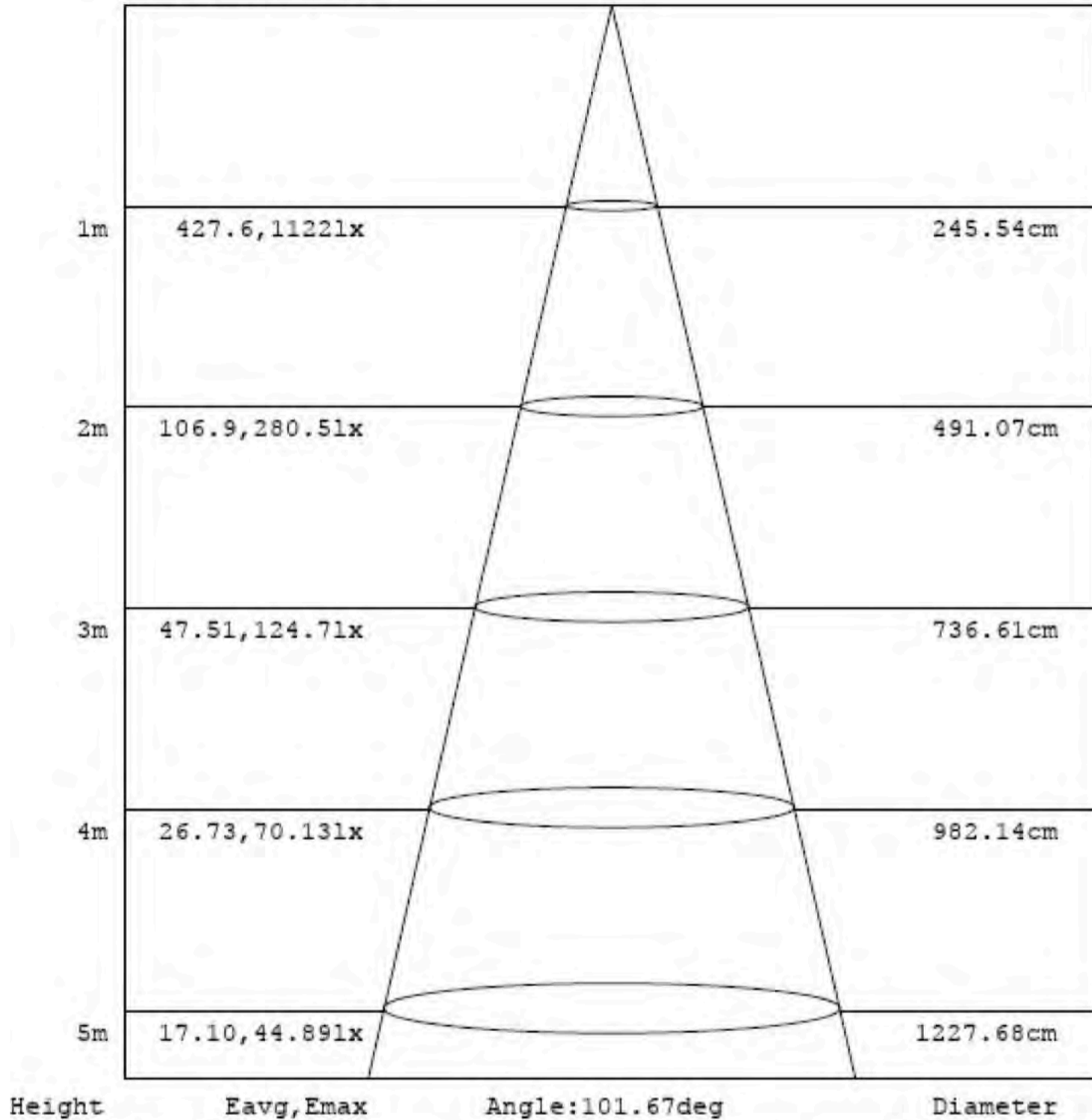
Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	T8L-IDFH13-1800-4ft-ABA 2 tubes In 2x4 troffer	
	Lumens	% Total
0- 10	106.265	3.61%
10- 20	305.591	10.38%
20- 30	465.429	15.82%
30- 40	558.98	18.99%
40- 50	560.653	19.05%
50- 60	448	15.22%
60- 70	278.044	9.45%
70- 80	158.519	5.39%
80- 90	57.806	1.96%
90-100	0.434	0.01%
100-110	0.468	0.02%
110-120	0.473	0.02%
120-130	0.465	0.02%
130-140	0.488	0.02%
140-150	0.483	0.02%
150-160	0.422	0.01%
160-170	0.253	0.01%
170-180	0.096	0.00%
Total	2942.9	100%
$\gamma(^{\circ})$	Lumens	% Total
0- 60	2444.918	83.08%
60- 90	494.369	16.80%
0-90	2939.287	99.88%
90- 180	3.582	0.12%
0- 180	2942.9	100%

Table 3: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method

Flux out: 2049 lm



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

Chart 1: Beam Angle

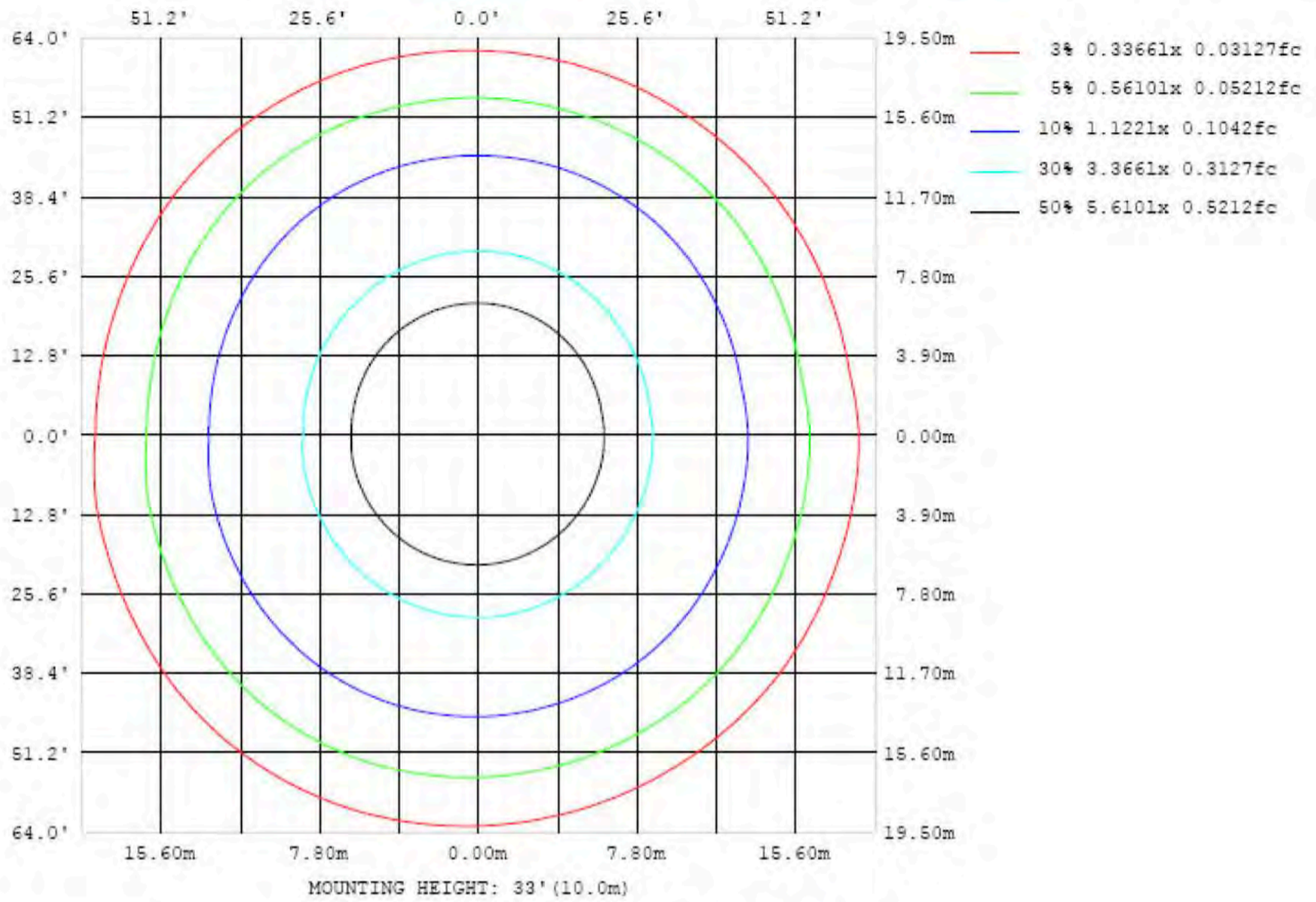


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

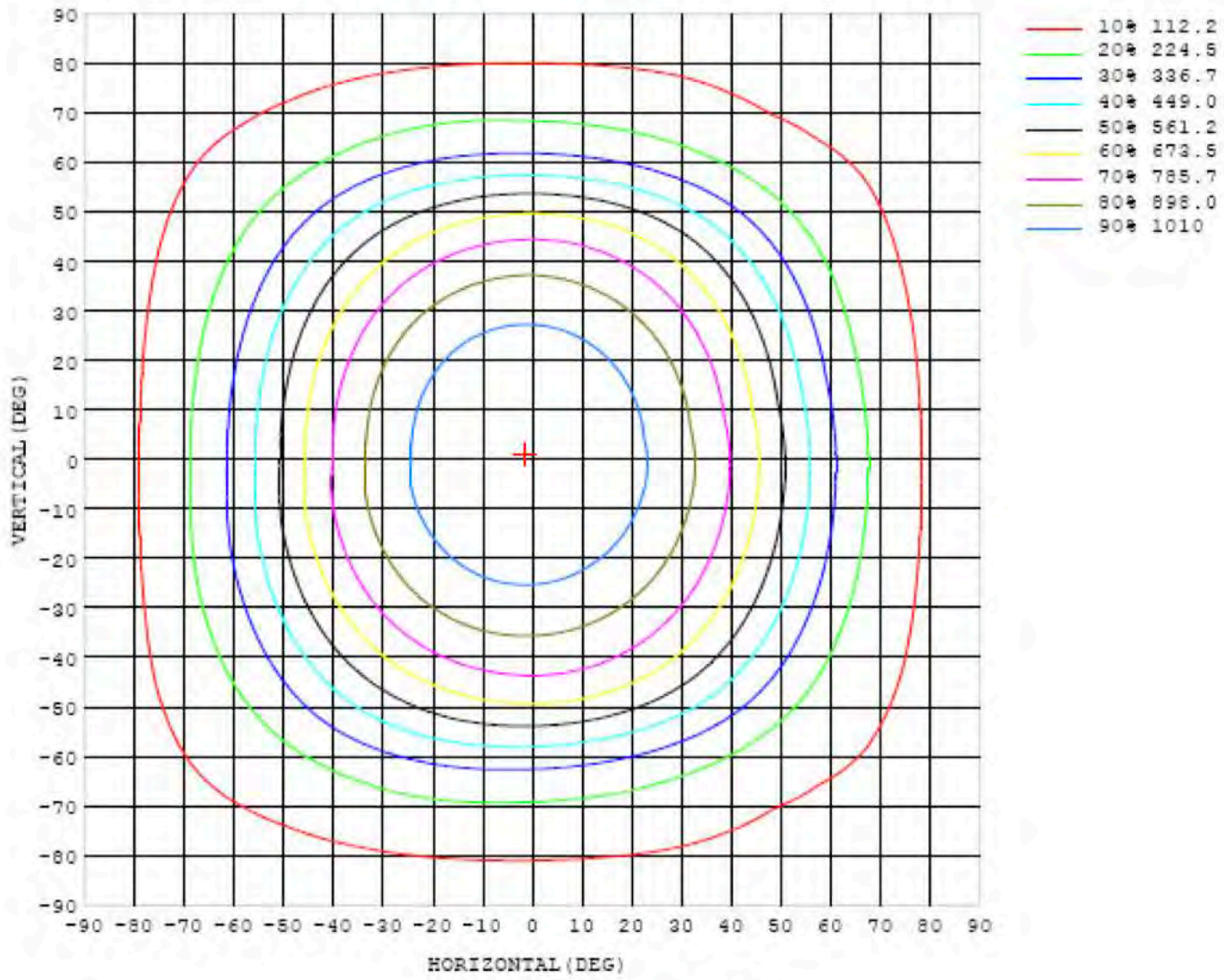


Chart 3: Isocandela Plot

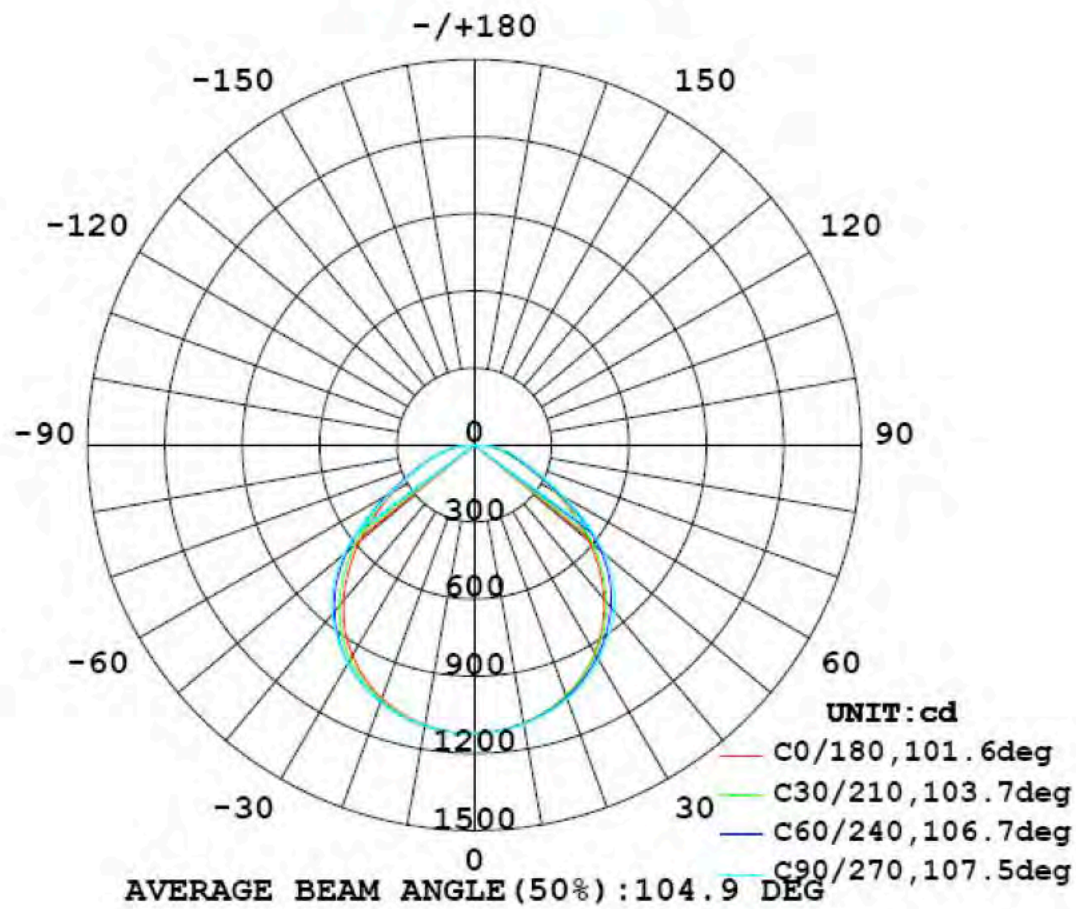


Chart 4: Polar Candela Distribution

Luminous Intensity Data

Table--1 UNIT: cd

C (DEG) \ γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122
5	1114	1115	1115	1115	1115	1115	1115	1116	1116	1117	1117	1117	1118	1118	1119	1119	1119	1118	1119
10	1098	1099	1099	1099	1099	1100	1100	1101	1102	1103	1104	1104	1105	1106	1106	1107	1108	1107	1106
15	1073	1074	1073	1074	1075	1076	1077	1079	1080	1081	1082	1083	1084	1084	1085	1085	1086	1085	1083
20	1038	1038	1038	1039	1041	1043	1045	1048	1050	1052	1053	1054	1055	1054	1054	1054	1054	1053	1049
25	992	992	993	995	997	1000	1004	1008	1011	1014	1015	1016	1016	1015	1014	1012	1012	1010	1004
30	934	935	936	939	943	948	952	957	962	965	967	968	968	966	963	960	958	955	947
35	864	866	868	873	879	885	892	898	904	907	909	909	908	905	900	895	891	887	876
40	781	783	787	794	803	813	823	832	839	843	843	841	837	831	824	817	810	805	790
45	685	688	693	702	715	729	742	754	762	764	763	758	751	742	733	723	715	708	690
50	579	582	588	598	612	626	640	650	658	662	661	656	648	639	628	617	607	599	579
55	468	470	475	484	495	507	515	522	528	533	539	541	537	529	518	505	495	487	466
60	359	359	361	367	376	380	383	387	393	400	407	415	418	416	408	397	387	382	363
65	264	263	262	264	266	268	273	278	284	290	298	304	307	307	305	298	293	292	278
70	193	190	186	181	180	186	197	205	211	215	221	225	225	220	217	217	218	221	210
75	140	141	137	130	128	137	150	158	162	165	168	169	167	159	153	156	160	163	153
80	98.7	101	98.4	94.0	96.2	103	112	117	120	123	124	123	119	115	111	110	112	113	104
85	55.8	55.9	55.6	55.6	56.7	59.9	63.5	65.7	66.0	66.0	68.1	68.8	66.3	63.5	63.8	64.0	62.2	62.2	51.2
90	0.85	1.30	0.80	0.65	0.58	0.40	0.35	0.37	0.43	0.48	0.50	0.46	0.85	1.18	1.56	1.91	2.84	3.46	3.85
95	0.29	0.45	0.45	0.45	0.45	0.42	0.42	0.40	0.39	0.39	0.38	0.31	0.30	0.31	0.41	0.49	0.41	0.40	0.18
100	0.45	0.43	0.47	0.49	0.50	0.50	0.42	0.43	0.45	0.47	0.52	0.49	0.48	0.50	0.50	0.48	0.44	0.40	0.37
105	0.49	0.44	0.49	0.50	0.53	0.55	0.57	0.57	0.59	0.58	0.58	0.57	0.56	0.56	0.52	0.51	0.46	0.45	0.39
110	0.46	0.46	0.48	0.48	0.53	0.55	0.57	0.58	0.60	0.60	0.61	0.59	0.57	0.55	0.54	0.51	0.46	0.51	0.33
115	0.46	0.45	0.46	0.47	0.49	0.52	0.56	0.57	0.59	0.59	0.59	0.57	0.56	0.55	0.50	0.47	0.42	0.45	0.38
120	0.50	0.54	0.51	0.45	0.46	0.46	0.50	0.54	0.58	0.58	0.58	0.55	0.51	0.48	0.46	0.45	0.45	0.51	0.44
125	0.54	0.55	0.57	0.49	0.47	0.48	0.49	0.50	0.52	0.52	0.52	0.50	0.49	0.49	0.47	0.54	0.53	0.56	0.53
130	0.57	0.50	0.67	0.59	0.55	0.51	0.52	0.53	0.55	0.55	0.53	0.54	0.52	0.51	0.53	0.57	0.58	0.62	0.61
135	0.67	0.69	0.79	0.67	0.61	0.62	0.62	0.58	0.60	0.60	0.59	0.60	0.62	0.63	0.63	0.67	0.69	0.70	0.67
140	0.70	0.68	0.79	0.81	0.70	0.72	0.69	0.68	0.69	0.71	0.67	0.70	0.72	0.71	0.69	0.83	0.63	0.74	0.76
145	0.77	0.76	0.73	0.99	0.88	0.75	0.75	0.77	0.79	0.80	0.79	0.79	0.76	0.74	0.90	0.94	0.71	0.76	0.79
150	0.84	0.83	0.78	0.92	1.11	0.97	0.82	0.78	0.81	0.83	0.78	0.76	0.84	1.00	1.08	0.85	0.76	0.82	0.87
155	0.85	0.85	0.80	0.80	1.00	1.13	1.08	1.05	0.99	0.97	0.99	1.05	1.11	1.19	0.97	0.87	0.88	0.89	0.91
160	0.87	0.87	0.86	0.82	0.85	0.96	1.14	1.24	1.22	1.20	1.24	1.27	1.12	0.98	0.97	0.91	0.93	0.93	0.92
165	0.87	0.86	0.86	0.86	0.86	0.93	0.94	0.92	0.95	0.97	0.96	0.95	0.98	0.97	0.92	0.90	0.94	0.95	0.93
170	0.88	0.89	0.91	0.94	0.96	0.96	0.95	0.94	0.94	0.98	0.97	0.98	0.98	0.98	0.96	0.94	0.92	0.89	0.88
175	1.06	1.07	1.09	1.09	1.08	1.08	1.08	1.09	1.07	1.02	1.00	1.03	1.04	1.03	1.03	1.02	1.03	1.04	1.04
180	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05

Table 4: 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	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122	1122		
5	1119	1120	1120	1120	1120	1120	1120	1120	1120	1119	1119	1118	1117	1117	1116	1115	1115		
10	1107	1108	1108	1109	1110	1110	1110	1110	1110	1109	1107	1106	1104	1102	1101	1099	1098		
15	1084	1086	1087	1089	1091	1092	1092	1092	1091	1089	1087	1085	1082	1079	1076	1074	1071		
20	1051	1054	1057	1060	1063	1065	1066	1066	1065	1063	1059	1055	1051	1046	1042	1038	1035		
25	1007	1011	1015	1020	1025	1028	1030	1030	1029	1026	1021	1016	1010	1004	998	992	988		
30	950	956	962	969	975	980	983	983	982	978	973	966	959	951	942	935	929		
35	880	887	896	905	913	919	923	925	924	920	914	905	896	885	875	865	858		
40	795	804	815	826	836	846	853	857	857	853	845	834	821	807	794	782	773		
45	695	705	718	731	745	757	765	771	774	771	762	749	733	716	700	686	675		
50	584	595	608	623	636	647	655	660	662	659	653	643	628	611	593	578	567		
55	470	480	492	505	516	521	522	520	518	516	513	508	502	490	476	464	454		
60	365	370	378	386	390	389	386	381	377	373	371	369	368	365	357	350	345		
65	277	276	278	281	282	283	282	277	272	268	265	260	256	254	253	252	251		
70	207	203	199	197	202	209	211	208	204	200	196	189	179	173	174	178	181		
75	151	148	141	139	147	156	159	159	157	155	151	143	131	123	124	131	133		
80	103	101	99.4	101	103	107	111	112	112	111	108	103	96.4	89.9	87.7	91.5	92.9		
85	50.8	50.0	48.7	46.0	45.2	46.4	47.8	45.9	44.8	45.7	46.9	46.2	45.6	45.0	46.0	46.2	46.2		
90	2.10	1.46	2.16	1.44	0.29	0.29	0.38	0.47	0.52	0.43	0.65	0.26	0.26	0.27	0.33	0.91	3.02		
95	0.32	0.35	0.39	0.36	0.34	0.34	0.36	0.39	0.38	0.38	0.35	0.30	0.31	0.38	0.34	0.27	0.28		
100	0.30	0.31	0.40	0.39	0.36	0.33	0.30	0.30	0.28	0.31	0.30	0.31	0.34	0.35	0.34	0.27	0.28		
105	0.33	0.35	0.38	0.40	0.40	0.41	0.39	0.39	0.38	0.39	0.37	0.37	0.37	0.34	0.33	0.31	0.33		
110	0.34	0.37	0.38	0.41	0.44	0.44	0.42	0.44	0.44	0.44	0.42	0.39	0.38	0.37	0.36	0.33	0.34		
115	0.37	0.42	0.42	0.41	0.43	0.47	0.48	0.49	0.49	0.49	0.47	0.43	0.40	0.40	0.41	0.41	0.39		
120	0.46	0.45	0.44	0.45	0.45	0.47	0.48	0.52	0.52	0.52	0.49	0.46	0.44	0.45	0.45	0.45	0.48		
125	0.48	0.57	0.56	0.49	0.50	0.52	0.52	0.53	0.54	0.54	0.53	0.52	0.49	0.50	0.53	0.54	0.49		
130	0.52	0.69	0.57	0.54	0.56	0.54	0.56	0.57	0.59	0.58	0.55	0.53	0.55	0.56	0.57	0.67	0.54		
135	0.60	0.72	0.71	0.63	0.63	0.62	0.61	0.58	0.60	0.59	0.59	0.58	0.60	0.59	0.68	0.64	0.65		
140	0.70	0.67	0.89	0.74	0.67	0.70	0.65	0.61	0.65	0.62	0.62	0.64	0.62	0.68	0.85	0.63	0.73		
145	0.78	0.68	0.80	1.00	0.80	0.66	0.67	0.67	0.70	0.67	0.64	0.63	0.74	0.94	0.73	0.70	0.81		
150	0.88	0.74	0.75	0.91	1.08	0.96	0.79	0.71	0.68	0.68	0.76	0.89	0.98	0.82	0.72	0.73	0.86		
155	0.93	0.83	0.79	0.81	0.83	0.98	1.07	1.09	1.03	1.06	1.05	0.99	0.80	0.76	0.72	0.79	0.85		
160	0.94	0.92	0.81	0.81	0.82	0.78	0.79	0.80	0.78	0.78	0.76	0.78	0.84	0.72	0.73	0.86	0.87		
165	0.96	0.96	0.92	0.84	0.78	0.76	0.76	0.76	0.77	0.76	0.74	0.76	0.78	0.78	0.85	0.87	0.89		
170	0.92	0.94	0.95	0.96	0.95	0.90	0.84	0.82	0.77	0.77	0.84	0.93	0.94	0.94	0.96	0.95	0.90		
175	1.07	1.08	1.10	1.10	1.12	1.07	1.04	1.01	0.93	1.01	0.97	1.03	1.05	1.05	1.05	1.06	1.07		
180	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 17, 2015	Jul. 16, 2016
Digital Power Meter	PF2010A	HZTE028-01	Jul. 17, 2015	Jul. 16, 2016
AC Power Supply	PCR 500L	HZTE001-08	Jul. 17, 2015	Jul. 16, 2016
DC Power Supply	WY12010	HZTE004-03	Jul. 17, 2015	Jul. 16, 2016
Temperature Meter	TES1310	HZTE017-01	Jul. 17, 2015	Jul. 16, 2016
Standard Source	D908	HZTE012-01	Jul. 23, 2015	Jul. 22, 2016
Standard source	SCL-1400	HZTE012-02	Oct. 21, 2015	Oct. 20, 2016

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 expanded uncertainty is 1.94% with a coverage factor $k=2$.

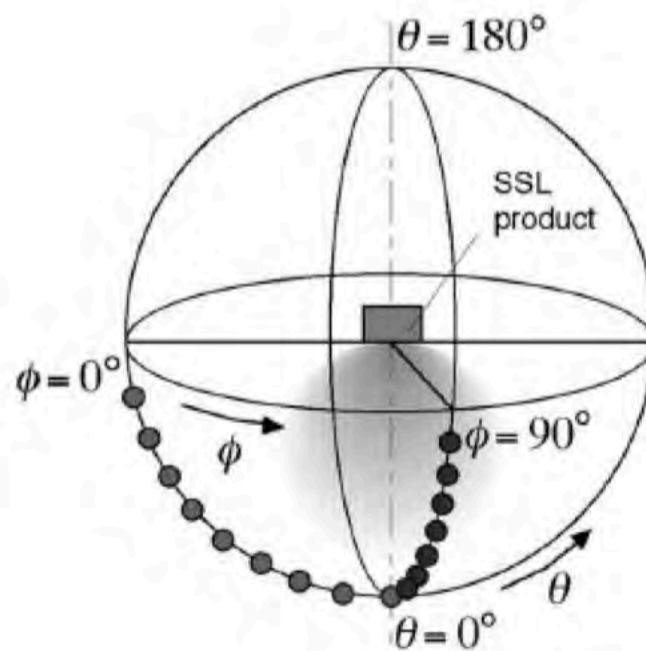
Color Characteristics Measurements

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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