



LM-79-08 Test Report

for

P.Q.L., Inc.

2285 Ward Avenue / Simi Valley, CA 93065

LED tube in 2x2 troffer

Model: 9056X-13-30K, 90562

9056X-13-30K was selected as the representative model.
All measurements are the same except CCT.

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ17010020c

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

Review by:

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Jan. 22, 2017

Approved by:



Manager: Jim Zhang
Jan. 22, 2017

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

Test Summary

Model	9056X-13-30K 2 tubes In 2x2 troffer
Luminous Efficacy (Lumens /Watt)	98.1
Total Luminous Flux (Lumens)	2924.4
Power (Watts)	29.81
Power Factor	0.9966
Stabilization Time (Light & Power)	60 mins
Note	3000K

Table 1: Executive Data Summary

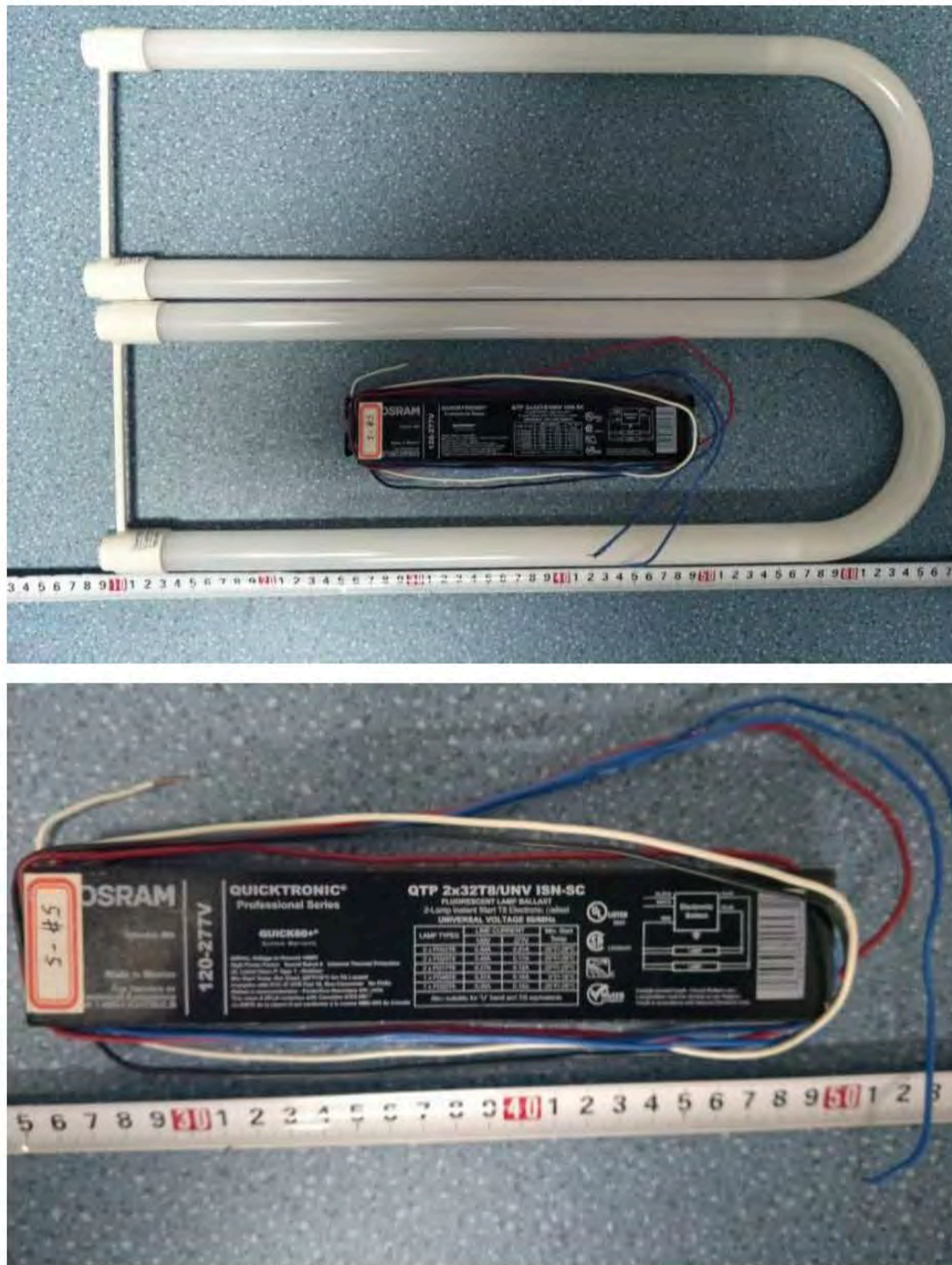
Test specifications:

Date of Receipt	: Jan. 12, 2017
Date of Test	: Jan. 19, 2017
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

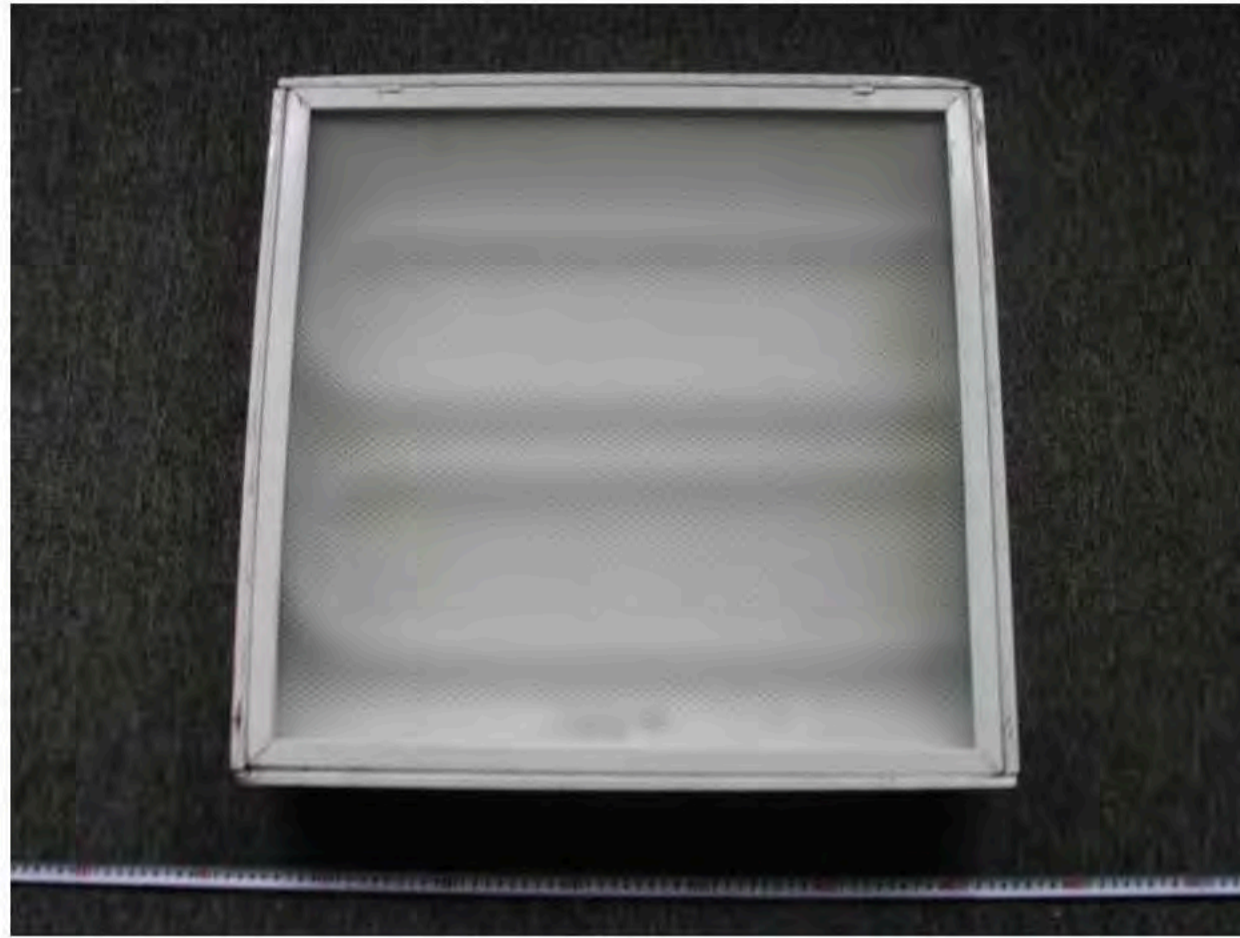
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Sample Photos



Sample view



Samples in Lithonia 2GT8 Lensed 2x2

Equipment Under Test (EUT)

Name	: LED tube
Model	: 9056X-13-30K
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: G13 base, 3000K Manufacturer of light source: EVERLIGHT ELECTRONICS CO., LTD Model of LED light source: 67-21S Series LED Tubes supplied by a high frequency fluorescent lamp ballast: QTP 2x32T8/UNV ISN-SC
Manufacturer	: P.Q.L., Inc.
Address	: 2285 Ward Avenue / Simi Valley, CA 93065

TEST RESULTS

Test ambient temperature was 24.7°C.

Test orientation was Base up. 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	9056X-13-30K 2 tubes In 2x2 troffer	
	Test Voltage (V)	120.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.249	0.113
Power Factor	0.9966	0.9583
Test Power (W)	29.81	29.97
Off state power	0	0
Luminous Efficacy (lm/W)	98.1	97.2
Total Luminous Flux (lm)	2924.4	2913.1
Center Beam Candle Power (cd)	1170	
Spacing Criteria	1.15 (0°)/ 1.26 (90°)	
Zonal Lumens in the 0°-60°Zone	83.81%	
Zonal Lumens in the 60°-90°Zone	15.73%	
Zonal Lumens in the 90°-120°Zone	0.29%	
Zonal Lumens in the 120°-180°Zone	0.17%	

Table 2: Test data per Goniophotometer Method

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	9056X-13-30K 2 tubes In 2x2 troffer	
	Lumens	% Total
0- 10	110.723	3.79%
10- 20	317.57	10.86%
20- 30	480.531	16.43%
30- 40	567.849	19.42%
40- 50	550.69	18.83%
50- 60	423.476	14.48%
60- 70	257.934	8.82%
70- 80	149.194	5.10%
80- 90	52.794	1.81%
90-100	3.564	0.12%
100-110	2.953	0.10%
110-120	1.995	0.07%
120-130	1.541	0.05%
130-140	1.359	0.05%
140-150	1.012	0.03%
150-160	0.673	0.02%
160-170	0.387	0.01%
170-180	0.109	0.00%
Total	2924.4	100%
$\gamma(^{\circ})$	Lumens	% Total
0- 60	2450.839	83.81%
60- 90	459.922	15.73%
0-90	2910.761	99.54%
90- 180	13.593	0.46%
0- 180	2924.4	100%

Table 3: Zonal Lumen Data

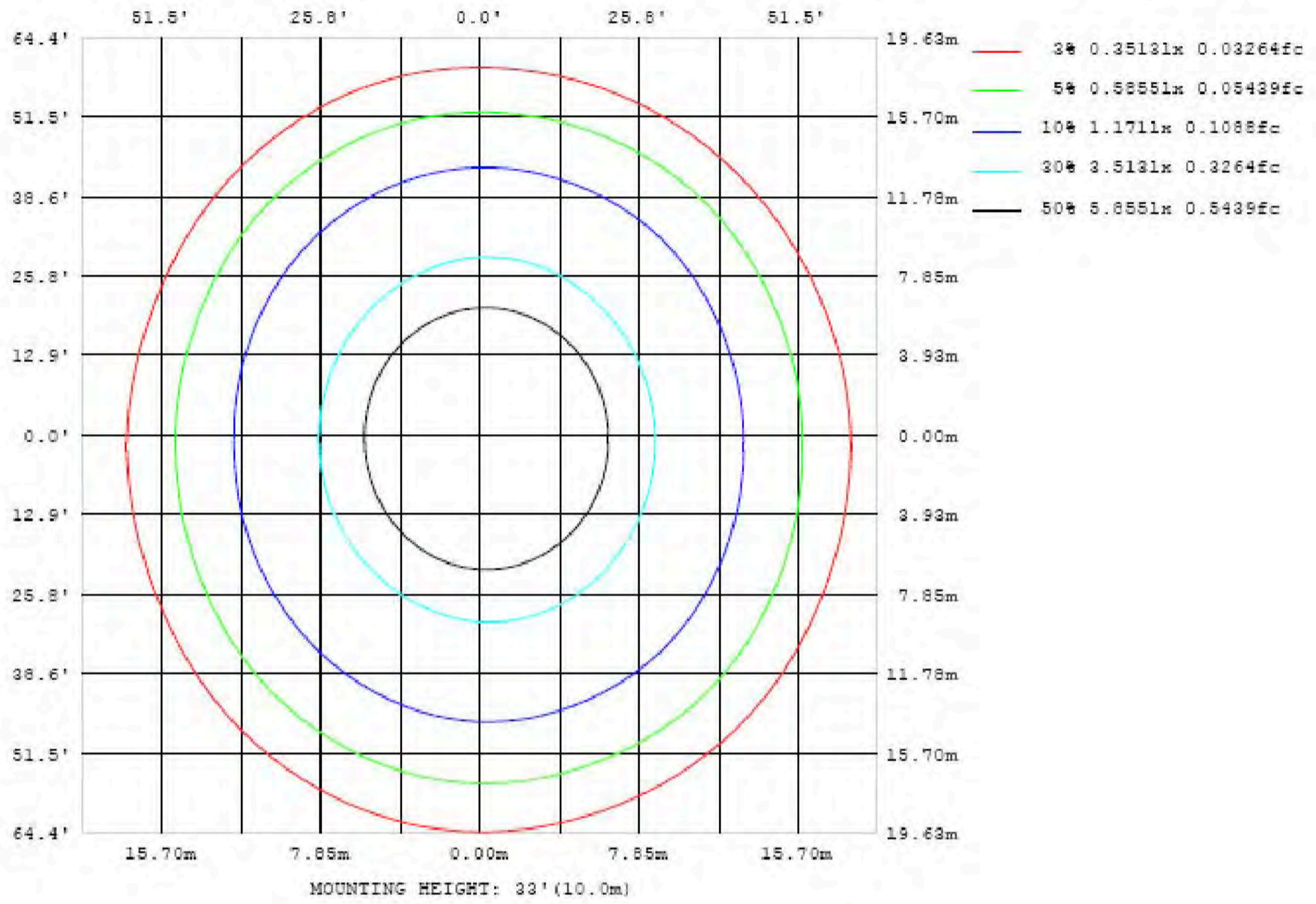


Chart 1: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

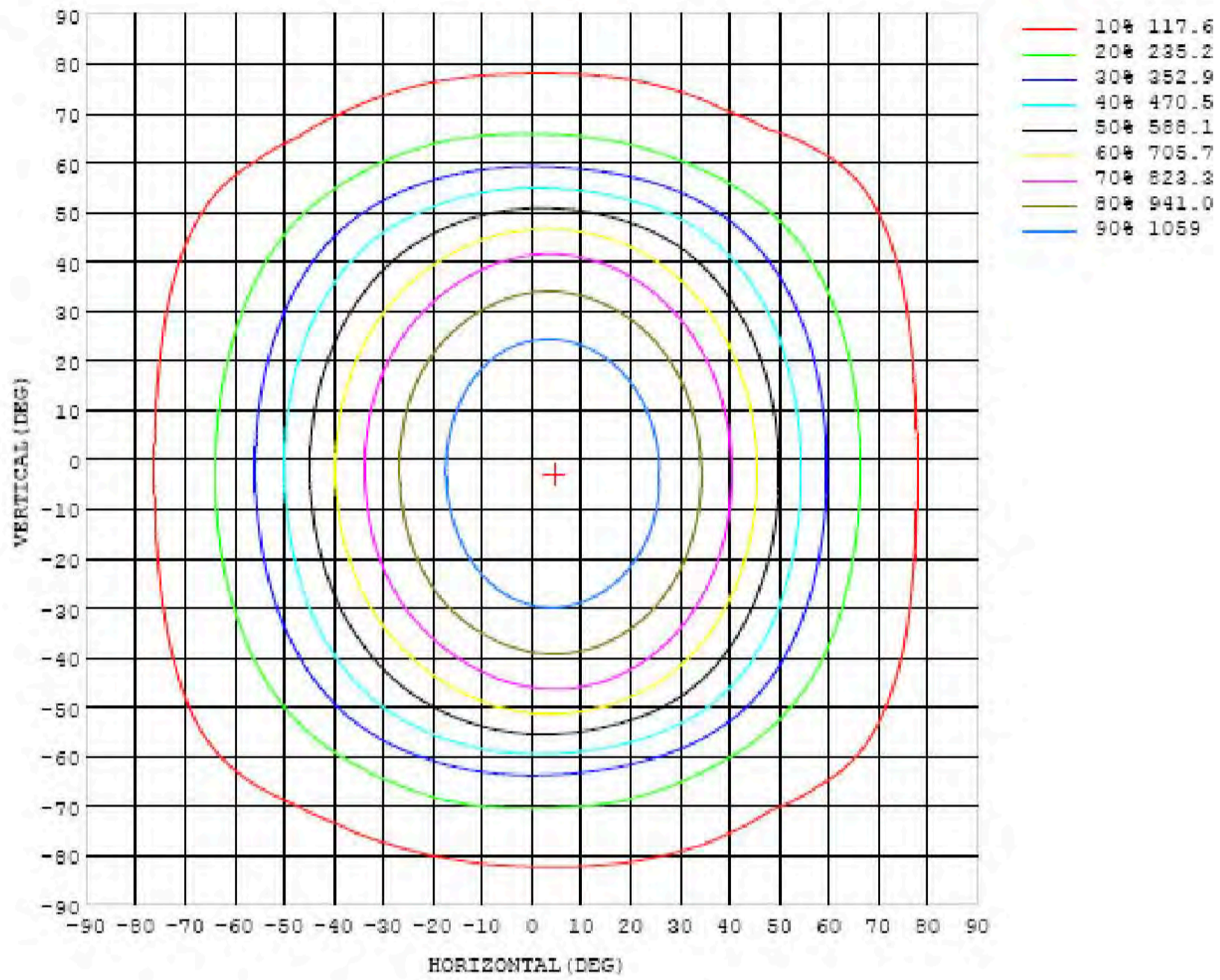


Chart 2: Isocandela Plot

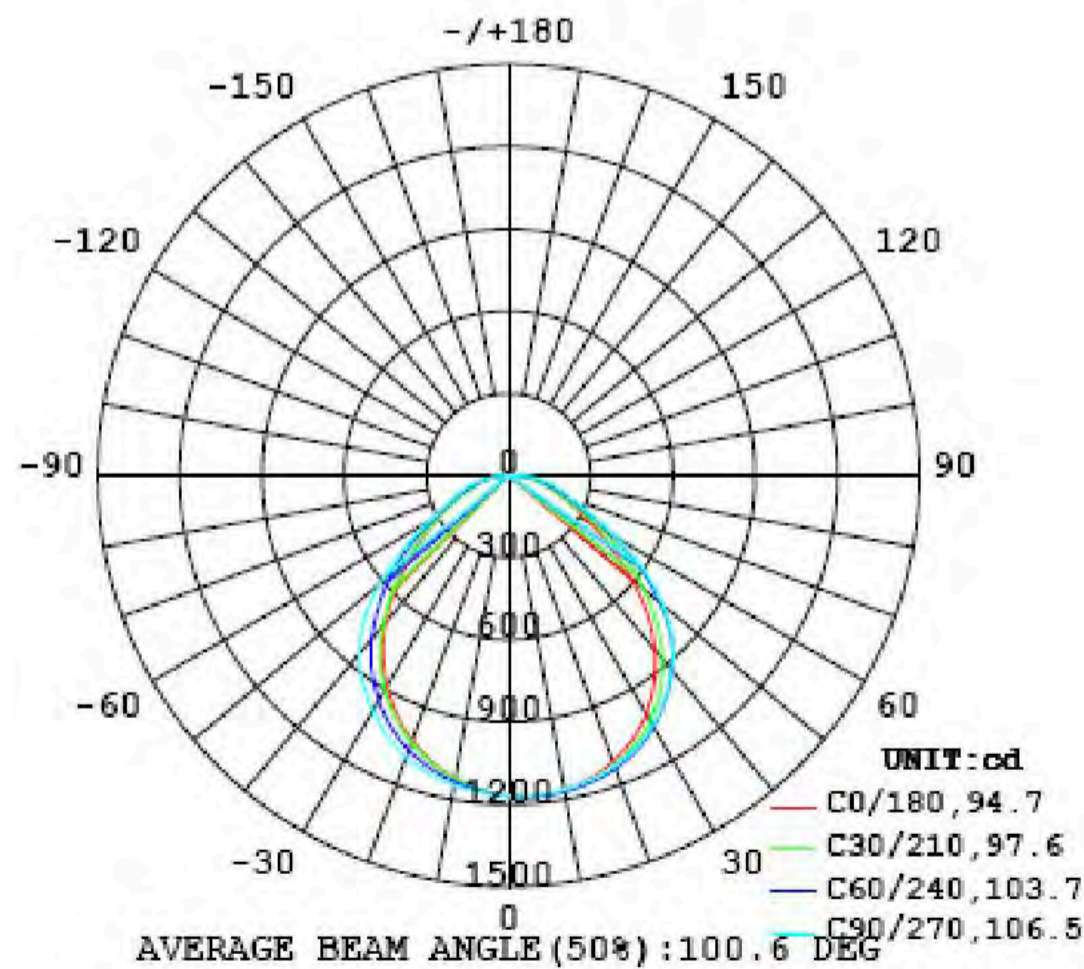


Chart 3: Polar Candela Distribution

Luminous Intensity Data

Table--1 UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170
5	1175	1175	1176	1176	1176	1176	1175	1174	1172	1170	1168	1166	1163	1161	1158	1156	1154	1153	1152
10	1166	1168	1170	1171	1172	1172	1172	1170	1167	1164	1159	1154	1148	1142	1137	1131	1127	1124	1122
15	1145	1147	1151	1154	1156	1159	1159	1158	1155	1150	1143	1134	1124	1114	1104	1096	1089	1084	1081
20	1111	1115	1120	1125	1131	1135	1138	1138	1135	1129	1119	1106	1092	1077	1063	1051	1040	1033	1029
25	1065	1071	1078	1086	1094	1101	1105	1107	1105	1097	1085	1069	1050	1031	1012	995	980	971	966
30	1004	1012	1022	1032	1043	1052	1059	1063	1061	1053	1038	1018	996	972	948	926	908	896	889
35	926	936	948	963	977	989	998	1003	1002	994	977	954	927	898	870	844	823	808	800
40	831	842	857	875	895	914	929	937	937	926	904	874	841	808	776	747	724	707	698
45	716	728	746	768	793	819	842	856	858	844	816	780	741	703	668	637	612	594	584
50	583	598	617	641	670	699	724	744	749	736	708	672	634	595	558	526	499	478	469
55	453	468	488	515	545	571	587	598	607	603	583	553	520	487	452	420	395	377	370
60	344	353	366	387	412	433	443	449	455	455	445	425	401	375	346	319	302	293	287
65	256	258	262	269	281	295	309	317	322	326	321	310	293	274	255	239	231	228	224
70	192	193	190	187	188	200	220	235	239	240	239	232	213	193	183	179	176	175	173
75	142	146	143	136	133	144	165	181	186	185	183	175	156	137	130	132	133	131	128
80	99.0	102	102	101	103	112	123	135	141	141	136	124	110	100	93.9	91.9	92.2	90.8	88.4
85	47.9	52.1	55.0	60.2	65.0	70.6	77.1	85.3	86.3	84.3	81.4	73.1	62.9	57.9	55.4	50.6	44.1	40.9	36.9
90	3.51	4.07	7.67	8.41	5.09	8.57	11.8	14.9	16.7	14.7	15.6	11.9	9.38	8.62	6.57	6.17	6.56	7.39	5.63
95	2.01	1.88	3.64	2.75	1.17	0.65	0.47	0.41	0.36	0.36	0.49	1.76	3.06	5.48	7.11	7.41	4.60	6.10	6.40
100	2.15	0.91	2.08	2.75	2.00	1.60	1.06	0.86	0.82	0.83	0.94	1.85	3.25	5.60	7.13	6.98	4.75	6.21	6.99
105	1.55	1.34	2.04	1.78	2.11	2.61	2.90	3.05	3.02	2.85	2.40	2.43	3.17	4.31	4.95	5.43	4.41	5.66	6.54
110	1.49	1.33	2.42	2.12	1.99	1.95	2.11	2.58	2.57	2.33	2.08	1.89	1.72	2.42	3.51	4.05	3.90	5.10	5.34
115	1.40	1.29	2.57	2.38	1.93	1.75	1.69	1.49	1.39	1.23	1.19	1.42	1.66	2.10	2.66	3.35	3.11	4.24	4.12
120	1.38	1.42	2.13	2.14	1.87	1.67	1.58	1.52	1.31	1.20	1.24	1.24	1.69	1.67	2.18	2.76	2.42	3.44	3.23
125	1.29	1.17	1.78	1.96	1.76	1.75	1.53	1.33	1.33	1.22	1.27	1.42	1.53	1.76	1.96	2.18	1.54	2.56	2.36
130	0.95	1.33	1.67	1.83	1.84	1.62	1.66	1.57	1.29	1.32	1.28	1.52	1.42	1.91	2.12	1.80	1.58	1.73	1.47
135	1.26	1.30	1.26	1.17	1.56	1.71	1.35	1.81	1.50	1.35	1.48	1.76	1.74	1.61	1.81	1.82	2.24	1.89	1.55
140	1.08	1.08	1.22	1.55	1.68	1.89	1.79	1.33	1.63	1.29	1.51	1.71	1.95	1.43	1.40	1.38	2.03	1.96	1.54
145	1.13	1.26	1.46	1.31	1.56	1.73	1.92	1.93	1.50	1.95	1.69	1.87	1.89	1.37	1.40	1.30	1.38	1.52	1.49
150	1.11	1.19	1.46	1.47	1.30	1.58	1.55	1.75	1.40	1.67	1.71	1.67	1.72	1.43	1.21	1.35	1.30	1.32	1.39
155	1.10	1.18	1.44	1.57	1.38	1.23	1.19	1.15	1.54	1.62	1.58	1.53	1.29	1.49	1.68	1.67	1.19	0.95	1.24
160	1.12	1.13	1.20	1.35	1.48	1.47	1.25	1.15	1.19	1.16	1.19	1.21	1.33	1.52	1.59	1.50	1.54	1.59	1.70
165	1.21	1.15	1.15	1.25	1.35	1.26	1.12	1.26	1.31	1.27	1.37	1.36	1.48	1.44	1.38	1.39	1.40	1.41	1.48
170	1.15	1.11	1.00	0.91	0.93	1.05	1.24	1.40	1.39	1.40	1.36	1.30	1.35	1.33	1.22	1.11	1.02	1.09	1.16
175	1.03	1.04	1.08	1.07	1.07	1.12	1.07	1.01	0.97	0.96	0.99	0.99	0.97	0.96	0.97	0.98	1.03	1.07	1.09
180	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24

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	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170		
5	1152	1152	1152	1154	1155	1157	1159	1160	1162	1164	1166	1168	1169	1171	1172	1173	1174		
10	1122	1122	1124	1127	1131	1135	1140	1144	1148	1152	1154	1157	1159	1160	1162	1163	1165		
15	1081	1082	1086	1091	1098	1105	1113	1120	1126	1131	1134	1136	1138	1139	1140	1141	1142		
20	1029	1032	1038	1046	1056	1066	1077	1087	1095	1100	1104	1105	1106	1106	1106	1107	1108		
25	965	970	978	989	1002	1015	1028	1040	1049	1055	1059	1060	1061	1060	1060	1060	1062		
30	889	894	905	918	932	948	965	979	990	997	1000	1001	1000	999	998	998	1000		
35	799	805	816	831	849	870	891	911	926	933	934	932	928	923	920	919	921		
40	696	701	713	730	752	777	805	830	849	858	858	850	840	831	824	821	824		
45	583	589	601	620	644	670	698	725	746	756	754	743	730	717	709	706	708		
50	471	480	494	514	536	557	579	598	612	618	616	612	604	591	580	576	577		
55	369	373	385	403	419	435	450	462	468	470	471	473	473	466	456	450	449		
60	281	279	286	297	309	320	330	335	336	335	337	338	338	335	333	333	338		
65	216	211	210	212	220	234	245	247	246	245	243	234	226	226	231	238	248		
70	166	160	152	148	157	174	188	191	191	191	186	171	156	155	166	177	187		
75	125	118	109	107	114	126	139	146	149	147	141	129	118	115	123	133	141		
80	84.6	78.6	76.7	74.2	75.2	79.0	88.7	93.0	94.9	96.9	95.0	90.0	87.1	84.7	85.6	91.0	96.2		
85	33.7	30.6	27.0	24.4	23.8	25.1	25.6	25.8	25.1	30.2	31.0	31.5	31.0	33.2	37.4	40.3	44.6		
90	5.01	6.34	7.99	6.88	5.23	3.30	1.22	0.40	0.41	0.44	0.51	0.58	0.71	1.42	1.51	2.75	1.95		
95	4.61	7.17	8.78	6.37	4.90	3.13	1.22	0.72	0.76	0.75	0.78	0.86	1.18	2.14	1.96	3.52	1.92		
100	2.29	5.65	6.62	4.83	3.92	3.02	2.24	2.35	2.50	2.51	2.43	2.39	2.33	2.12	1.47	1.80	2.31		
105	1.68	4.31	4.19	2.91	2.37	2.06	1.98	2.14	2.33	2.37	2.38	2.22	1.82	1.79	1.45	2.07	2.00		
110	1.81	3.46	2.92	2.33	2.01	1.67	1.17	1.09	1.18	1.25	1.38	1.50	1.70	2.00	1.99	2.47	1.82		
115	1.87	2.80	2.54	2.15	1.82	1.70	1.25	1.12	1.19	1.24	1.29	1.52	1.69	2.10	1.97	2.31	1.70		
120	1.93	2.26	2.22	2.12	1.97	1.54	1.49	1.33	1.37	1.42	1.52	1.66	1.94	2.08	1.80	1.55	1.46		
125	1.69	1.53	2.31	2.18	2.04	1.65	1.64	1.52	1.61	1.68	1.74	1.86	2.08	2.00	1.87	1.81	1.50		
130	2.15	1.86	2.29	2.41	1.98	2.10	1.98	1.87	2.00	2.02	2.06	2.03	2.01	1.63	1.69	1.35	1.26		
135	2.29	2.33	1.75	1.80	1.95	2.27	2.10	2.01	2.11	2.12	2.16	2.25	2.07	1.39	1.41	1.52	1.37		
140	2.03	1.73	1.57	1.63	1.82	2.15	2.30	2.37	2.45	2.14	2.22	2.06	1.65	1.56	1.37	1.21	1.18		
145	1.64	1.48	1.48	1.82	1.70	1.95	2.11	2.14	2.20	1.79	2.01	1.38	1.43	1.52	1.60	1.52	1.41		
150	1.50	1.59	1.50	1.78	1.75	1.73	1.75	1.72	1.69	1.32	1.44	1.40	1.44	1.52	1.62	1.51	1.40		
155	1.27	1.60	1.83	1.78	1.62	1.56	1.44	1.44	1.43	1.34	1.24	1.34	1.62	1.59	1.49	1.39	1.39		
160	1.88	1.81	1.82	1.78	1.62	1.54	1.46	1.44	1.42	1.33	1.17	1.33	1.54	1.49	1.40	1.40	1.34		
165	1.54	1.60	1.56	1.46	1.50	1.54	1.52	1.48	1.62	1.59	1.41	1.22	1.23	1.35	1.32	1.41	1.33		
170	1.30	1.29	1.27	1.27	1.19	1.16	1.22	1.26	1.24	1.24	1.29	1.14	1.06	1.11	1.15	1.21	1.16		
175	1.12	1.17	1.19	1.20	1.21	1.23	1.26	1.31	1.20	1.29	1.23	1.12	1.25	1.27	1.20	1.11	1.10		
180	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 27, 2016	Jul. 26, 2017
Digital Power Meter	PF2010A	HZTE028-01	Jul. 27, 2016	Jul. 26, 2017
AC Power Supply	PCR 500L	HZTE001-08	Jul. 27, 2016	Jul. 26, 2017
DC Power Supply	WY12010	HZTE004-03	Jul. 27, 2016	Jul. 26, 2017
Temperature Meter	TES1310	HZTE017-01	Jul. 27, 2016	Jul. 26, 2017
Standard Source	D908	HZTE012-01	Jul. 27, 2016	Jul. 26, 2017
Standard source	SCL-1400	HZTE012-02	Jul. 27, 2016	Jul. 26, 2017

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 $k=2$.

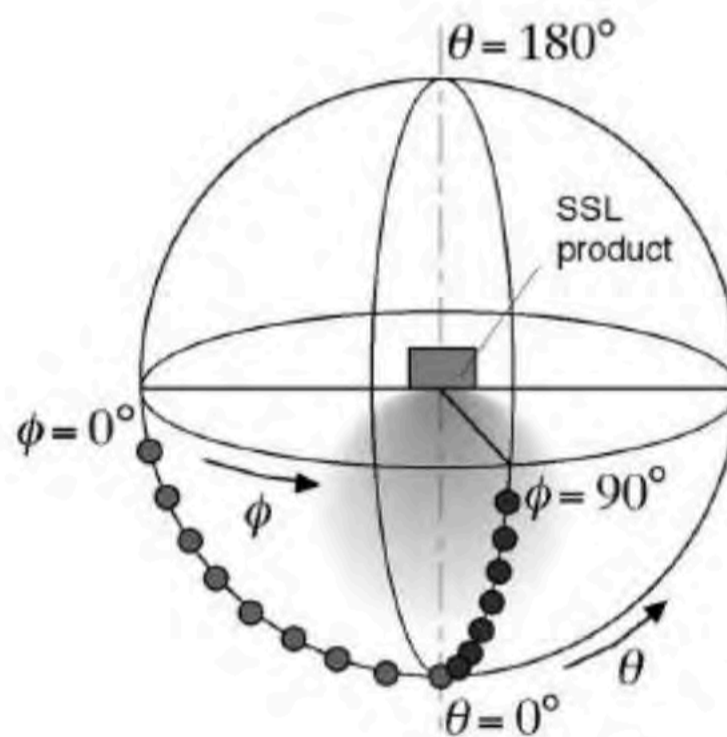
Color Characteristics Measurements

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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