

LM-79-19 TEST REPORT

for

Industrial Lighting Products, LLC

3224 McCraney Loop, Sanford, FL, 32771

LED Retrofit-kits in Lithonia 2GT8 lensed 2x2

Model: ULB2-20L-U-50-L2

ULB2-20L-U-50-L2-MWS

20LB/2F/850/U/A2

20LB/2F/850/U/A2/MWS

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ25030014g

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

Review by:

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Approved by:



April Zou

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May 28, 2025

1 Manager: April Zou
May 28, 2025

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: **ULB2-20L-U-50-L2**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
125.1	2745.4	21.94	0.9953
CCT (K)	CRI	Stabilization Time (Light & Power)	
5238	83.3	50	

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. 18, 2025
Date of Test	: Mar. 19, 2025
Test item	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
Reference Standard	: IESNA LM-79-2019 Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products ANSI/IES TM-30-18 IES Method for Evaluating Light Source Color Rendition

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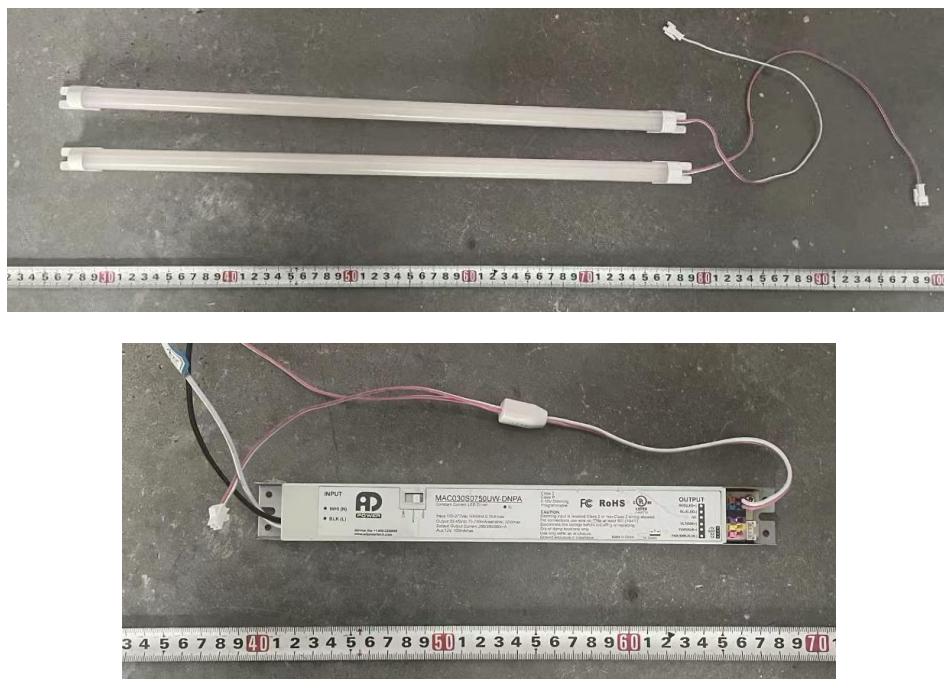
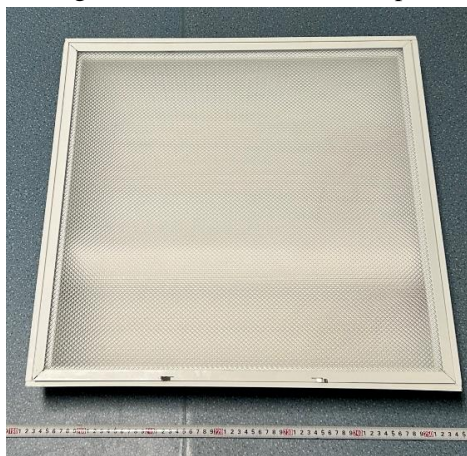


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x2

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB2-20L-U-50-L2	ULB2-20L-U-50-L2-MWS
	20LB/2F/850/U/A2	20LB/2F/850/U/A2/MWS
Electrical Ratings	: 120-277V, 50/60Hz	
Product Description	: Field-Adjustable 22W/18W/14W, 5000K LED Tube supplied by a LED driver: MAC030S0750UW-DNPA	
Manufacturer	: Industrial Lighting Products, LLC	
Address	: 3224 McCraney Loop, Sanford, FL, 32771	

TEST RESULTS

Test ambient temperature was 26.0 °C.

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

The stabilization time of the sample was 50 minutes, and the total operating time including stabilization was 55 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.184	0.083
Power Factor	0.9953	0.9532
Test Power (W)	21.94	21.85
THD A%	5.92	9.91
Luminous Efficacy (lm/W)	125.1	124.8
Total Luminous Flux (lm)	2745.4	2726.5
Color Rendering Index (CRI)	83.3	
R9	14.1	
Correlated Color Temperature (CCT)(K)	5238	
Chromaticity Chroma x	0.3387	
Chromaticity Chroma y	0.3467	
Chromaticity Chroma u	0.2090	
Chromaticity Chroma v	0.3209	
Duv	0.0002	
Chromaticity Chroma u'	0.2090	
Chromaticity Chroma v'	0.4813	

Special Color Rendering Indices	
R1	82.5
R2	87.3
R3	90
R4	84.3
R5	83.2
R6	81.9
R7	87
R8	70.4
R9	14.1
R10	69.4
R11	84.1
R12	60.5
R13	83.6
R14	94.5

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 24.8 °C.

The photometric distance is 30 m.

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

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.184
Power Factor	0.9954
Power (W)	21.95
Luminous Efficacy (lm/W)	125.4
Total Luminous Flux (lm)	2752.6
Beam Angle (°)	99.5 (0°-180°) / 88.4 (90°-270°)
Center Beam Candle Power (cd)	1198
Maximum Beam Candle Power (cd)	1201 (At: C=180.0, Gamma=0.5)
Spacing Criteria	1.28 (0°-180°) / 1.16 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	84.91%
Zonal Lumens in the 60 °-90 °Zone	14.65%
Zonal Lumens in the 90 °-120 °Zone	0.16%
Zonal Lumens in the 120 °-180 °Zone	0.28%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

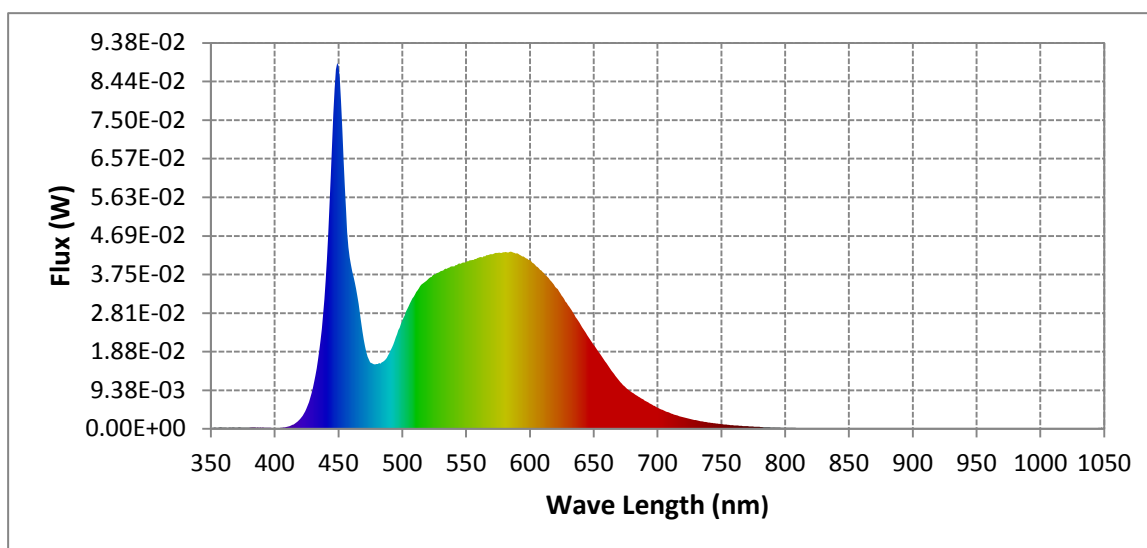
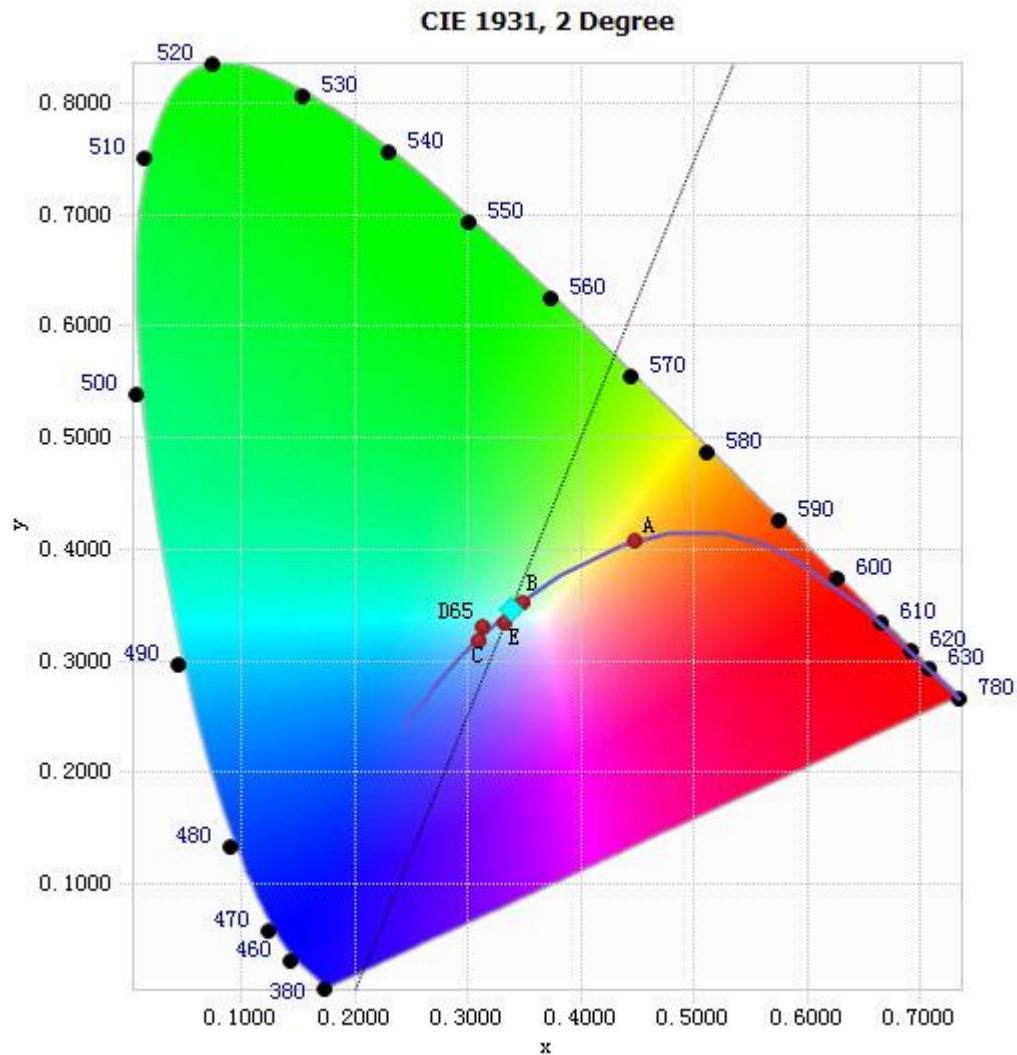


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.53E-04	485	1.63E-02	590	4.27E-02	695	6.03E-03
385	3.22E-04	490	1.84E-02	595	4.19E-02	700	5.21E-03
390	2.88E-04	495	2.22E-02	600	4.10E-02	705	4.49E-03
395	2.37E-04	500	2.62E-02	605	3.95E-02	710	3.84E-03
400	1.88E-04	505	2.97E-02	610	3.80E-02	715	3.31E-03
405	2.50E-04	510	3.26E-02	615	3.66E-02	720	2.85E-03
410	5.07E-04	515	3.51E-02	620	3.45E-02	725	2.45E-03
415	1.09E-03	520	3.63E-02	625	3.24E-02	730	2.11E-03
420	2.34E-03	525	3.75E-02	630	3.01E-02	735	1.79E-03
425	4.97E-03	530	3.83E-02	635	2.77E-02	740	1.54E-03
430	9.93E-03	535	3.89E-02	640	2.53E-02	745	1.33E-03
435	1.90E-02	540	3.95E-02	645	2.28E-02	750	1.16E-03
440	3.60E-02	545	4.01E-02	650	2.04E-02	755	9.89E-04
445	6.91E-02	550	4.05E-02	655	1.82E-02	760	8.40E-04
450	8.82E-02	555	4.10E-02	660	1.60E-02	765	7.23E-04
455	5.86E-02	560	4.15E-02	665	1.38E-02	770	6.37E-04
460	3.98E-02	565	4.19E-02	670	1.17E-02	775	5.61E-04
465	3.22E-02	570	4.24E-02	675	1.01E-02	780	4.81E-04
470	2.16E-02	575	4.27E-02	680	8.83E-03		
475	1.62E-02	580	4.29E-02	685	7.83E-03		
480	1.57E-02	585	4.31E-02	690	6.90E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3387, 0.3467)

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

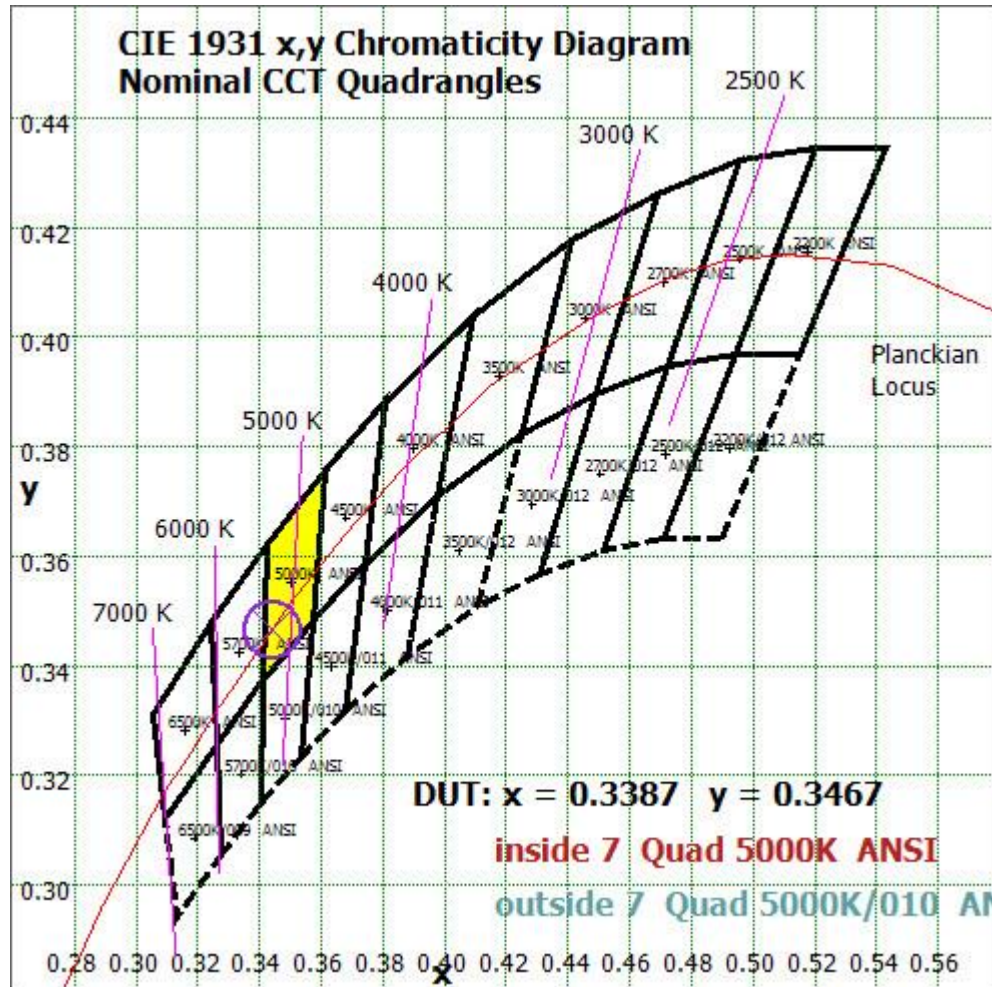
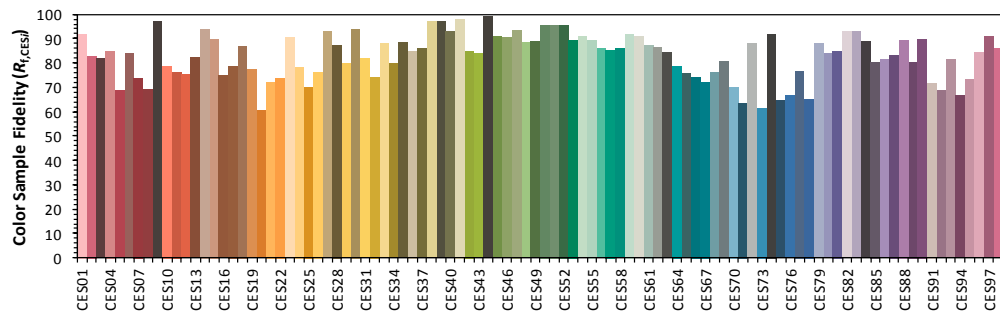
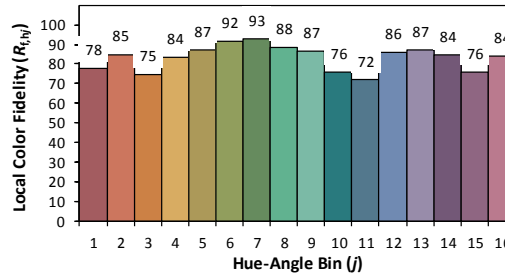
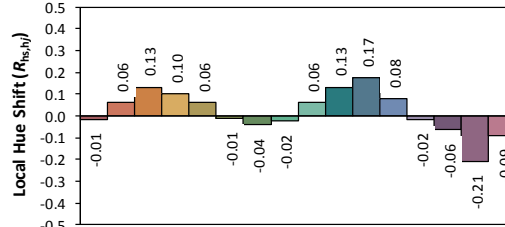
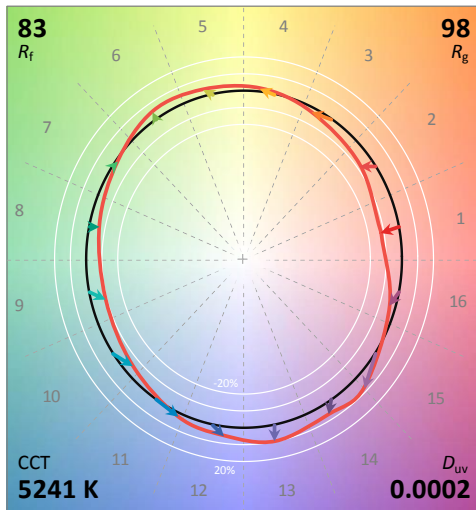
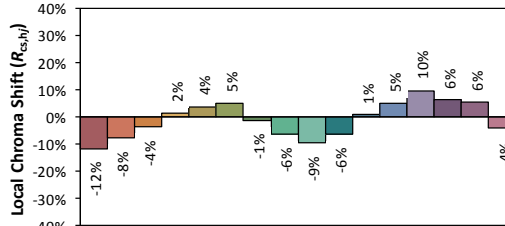
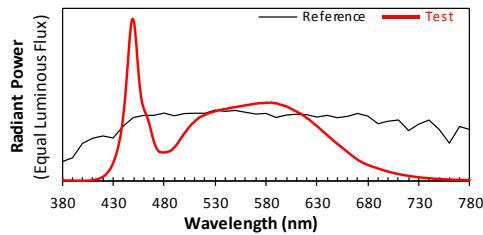


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

**Color Rendition Report – Sphere Spectroradiometer Method****ANSI/IES TM-30-18 Color Rendition Report****Source:** LED**Manufacturer:** Industrial Lighting Products, LLC**Date:** 2025/03/19**Model:** ULB2-20L-U-50-L2

Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x 0.3387
 y 0.3467
 u' 0.2090
 v' 0.4813

CIE 13.3-1995
(CRI)

R_a 83
 R_g 14

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

Chart 4: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 2 due to rounding.

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	113.257	4.11%
10- 20	322.647	11.72%
20- 30	478.628	17.39%
30- 40	545.849	19.83%
40- 50	502.791	18.27%
50- 60	374.047	13.59%
60- 70	226.223	8.22%
70- 80	132.886	4.83%
80- 90	44.064	1.60%
90-100	0.968	0.04%
100-110	1.449	0.05%
110-120	1.994	0.07%
120-130	2.025	0.07%
130-140	1.851	0.07%
140-150	1.642	0.06%
150-160	1.288	0.05%
160-170	0.787	0.03%
170-180	0.24	0.01%
Total	2752.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	2337.219	84.91%
60- 90	403.173	14.65%
0-90	2740.392	99.56%
90- 180	12.244	0.44%
0- 180	2752.6	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

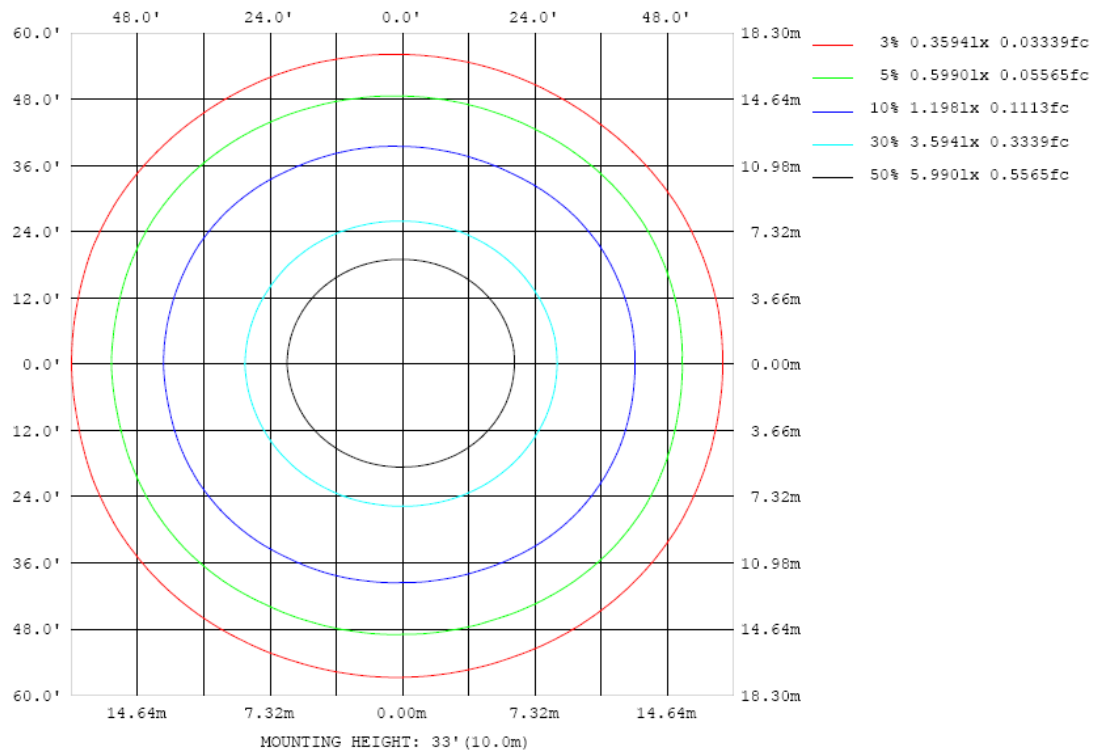


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

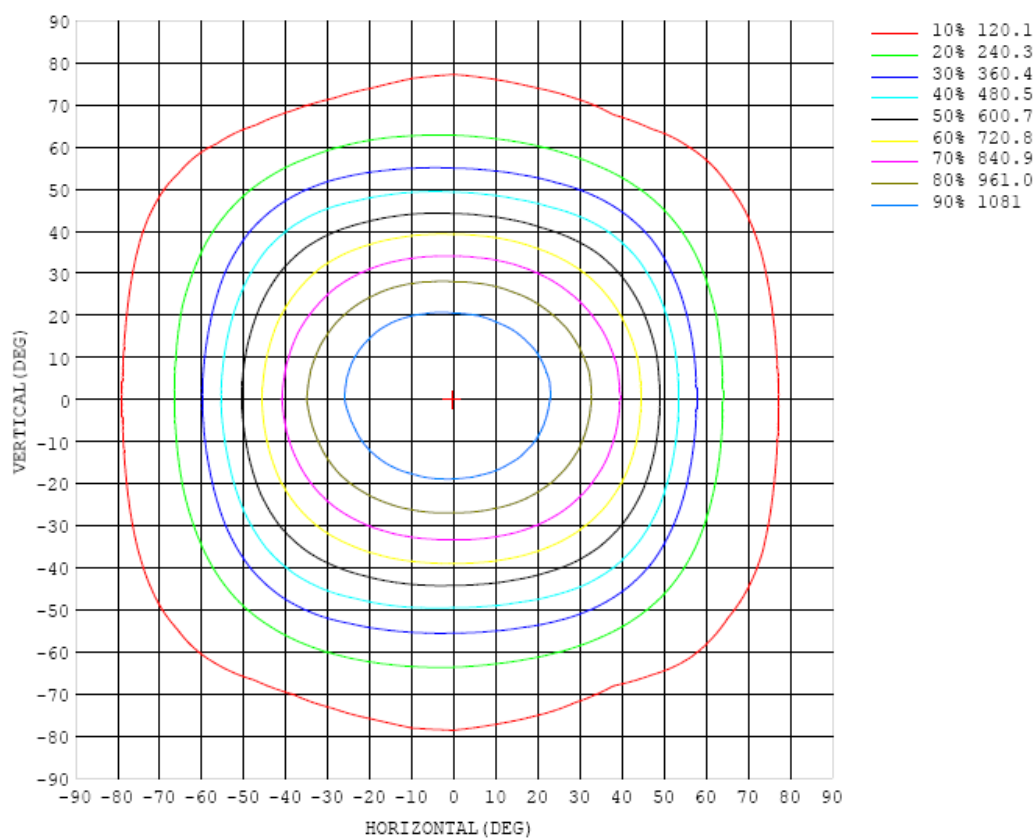


Chart 6: Isocandela Plot

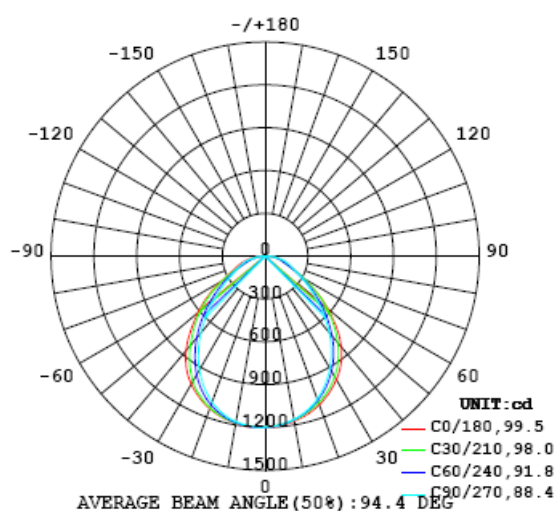


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198
5	1192	1187	1188	1186	1186	1188	1188	1185	1188	1184	1188	1190	1189	1191	1191	1193	1193	1195	1200
10	1174	1169	1168	1166	1165	1164	1164	1162	1163	1163	1165	1166	1168	1172	1174	1179	1180	1185	1188
15	1145	1142	1141	1135	1133	1129	1126	1124	1123	1120	1126	1130	1134	1140	1146	1152	1157	1162	1169
20	1109	1103	1098	1092	1088	1081	1075	1069	1068	1067	1069	1077	1084	1095	1105	1114	1120	1127	1138
25	1058	1052	1049	1040	1031	1020	1011	1001	995	992	999	1007	1019	1034	1048	1063	1073	1082	1091
30	998	993	987	974	960	944	931	918	910	907	911	923	938	956	976	996	1011	1023	1036
35	926	918	907	891	873	854	838	822	812	807	811	824	841	863	888	910	929	946	962
40	830	823	810	790	770	749	730	713	701	698	704	718	735	758	784	809	831	851	862
45	707	704	695	679	659	637	614	595	585	582	591	605	624	650	677	700	719	729	738
50	574	573	571	560	545	524	500	481	472	469	479	495	513	542	568	589	602	606	614
55	434	435	438	436	427	411	392	377	371	370	376	387	403	430	452	470	478	481	492
60	312	311	312	313	307	300	292	286	285	287	291	297	308	324	338	349	352	351	357
65	226	224	223	218	210	208	211	217	222	227	229	230	231	233	237	245	252	257	260
70	177	172	161	153	145	141	151	166	179	186	186	182	169	158	157	166	180	197	206
75	138	133	120	117	113	110	116	128	141	150	149	138	124	117	117	123	131	146	163
80	93.9	94.0	84.3	83.0	86.3	82.9	86.3	90.0	97.6	106	103	89.8	85.2	82.2	79.9	87.6	89.4	101	108
85	44.8	49.1	47.7	42.6	44.5	39.5	45.2	46.7	52.1	48.9	51.4	46.8	41.8	38.8	38.0	43.5	44.8	47.5	47.5
90	2.07	2.05	2.79	3.48	3.16	4.37	4.91	4.53	4.00	3.40	3.99	4.31	5.10	3.87	2.36	1.28	0.57	0.14	0.10
95	0.15	0.15	0.38	0.34	1.13	0.73	0.76	0.82	0.91	0.76	0.99	1.01	1.15	1.54	0.90	0.61	0.38	0.19	0.35
100	0.45	0.52	0.60	0.71	0.83	0.99	1.33	1.41	1.13	0.84	1.18	1.52	1.95	1.51	1.29	0.77	0.63	0.49	0.45
105	0.60	0.69	0.76	0.88	1.29	1.70	2.12	1.81	1.34	1.17	1.50	1.87	2.26	2.82	1.86	1.00	0.87	0.69	0.59
110	0.81	1.04	1.09	1.61	1.67	2.37	2.10	1.99	1.56	1.65	1.82	2.12	2.57	2.94	2.73	1.66	1.33	1.06	0.85
115	1.08	1.42	1.23	1.78	2.16	2.53	2.43	2.13	1.81	2.04	2.17	2.62	2.58	2.78	2.90	2.42	2.21	1.87	1.54
120	1.81	1.35	1.89	1.75	1.94	2.27	2.33	2.03	2.24	2.60	2.51	2.80	2.67	2.84	2.68	2.83	2.00	1.95	1.73
125	1.69	1.56	1.86	1.73	2.06	2.11	2.26	2.21	2.57	2.99	2.80	2.83	3.03	2.58	2.68	2.51	2.88	2.32	2.78
130	1.90	1.48	2.03	1.85	2.29	2.33	2.08	2.22	2.58	3.19	2.90	2.64	2.92	2.84	2.66	2.41	2.61	2.50	2.75
135	1.97	1.59	2.17	2.20	2.05	2.26	2.35	2.65	3.06	3.42	3.31	2.94	3.03	2.86	2.43	2.55	2.62	2.08	2.60
140	2.18	1.74	2.40	2.44	2.12	1.93	2.51	2.85	3.37	3.62	3.54	3.01	2.71	2.81	2.59	2.55	2.70	1.48	2.47
145	2.17	2.13	2.05	2.16	2.21	2.55	2.69	2.71	3.37	3.64	3.51	2.93	2.84	2.85	2.98	2.60	2.53	1.67	2.61
150	2.01	1.95	1.51	2.48	2.78	2.88	2.75	3.00	3.57	3.67	3.75	3.20	3.06	2.94	2.73	2.97	2.45	2.04	2.59
155	2.71	2.89	1.91	2.35	2.94	2.95	2.89	3.54	3.83	3.76	3.67	3.41	2.80	2.83	2.90	2.74	2.20	2.34	3.00
160	2.91	3.06	2.30	1.84	2.45	2.95	3.48	3.81	3.91	3.77	3.49	3.49	3.13	3.06	3.03	2.47	2.15	2.60	2.73
165	2.72	2.85	2.71	2.02	1.79	2.72	3.33	3.66	3.74	3.70	3.53	3.44	3.15	2.70	2.14	2.15	2.29	2.86	2.95
170	3.39	3.45	3.55	3.21	2.18	1.86	1.74	1.85	2.24	2.14	2.08	1.95	1.83	2.06	2.17	2.42	2.81	2.87	2.81
175	2.00	2.10	2.15	2.09	2.04	1.99	1.99	1.98	1.87	1.88	1.93	2.23	2.73	3.07	3.34	3.36	3.31	3.27	3.17
180	2.23	2.24	2.21	2.23	2.14	2.29	2.33	2.25	2.35	2.56	2.51	2.39	2.21	2.12	2.05	1.73	1.56	1.57	2.16

Table 6: 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	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198		
5	1196	1196	1197	1198	1197	1199	1196	1197	1193	1197	1197	1192	1193	1191	1191	1189	1192		
10	1186	1189	1186	1185	1186	1184	1182	1179	1178	1178	1176	1175	1175	1174	1174	1175	1172		
15	1168	1168	1165	1164	1160	1155	1150	1147	1142	1142	1144	1143	1144	1145	1147	1146	1148		
20	1134	1135	1131	1127	1117	1110	1099	1093	1088	1088	1089	1092	1097	1101	1105	1107	1111		
25	1091	1089	1081	1071	1059	1045	1031	1020	1013	1014	1018	1024	1034	1043	1052	1057	1060		
30	1034	1027	1013	996	978	960	942	930	922	924	931	941	953	967	982	991	1000		
35	953	942	924	902	879	859	840	825	819	821	830	841	857	874	894	913	926		
40	854	838	814	795	769	746	725	712	701	704	712	725	745	768	790	810	828		
45	732	722	703	684	657	628	607	591	580	578	584	599	625	651	671	691	708		
50	609	601	590	570	542	509	490	475	463	461	465	477	504	531	553	565	577		
55	488	481	471	451	426	400	380	368	359	357	360	369	387	407	423	430	437		
60	355	357	348	332	315	301	290	280	275	272	272	273	278	289	301	307	313		
65	262	253	238	225	217	217	220	219	218	212	206	198	193	195	206	218	228		
70	202	178	160	146	146	156	169	178	179	171	160	148	136	137	146	157	172		
75	149	128	115	111	110	110	120	134	141	131	120	113	108	110	113	117	130		
80	100	85.0	78.9	69.8	68.0	71.5	72.8	86.8	88.5	86.1	78.8	78.7	75.6	79.5	80.2	80.6	91.9		
85	47.9	39.5	33.3	31.1	26.3	26.4	28.3	33.7	31.2	35.1	33.4	34.9	31.6	36.8	37.2	43.7	50.3		
90	0.09	0.20	0.34	0.78	2.90	3.20	1.60	0.62	0.58	0.67	2.19	1.07	0.80	1.10	0.72	0.87	0.51		
95	0.42	0.37	0.50	0.62	0.71	0.87	0.89	0.86	0.54	0.93	0.75	2.20	0.61	0.57	0.42	0.32	0.20		
100	0.52	0.60	0.75	1.07	1.40	1.63	1.77	1.07	0.79	1.00	1.50	1.17	1.26	0.92	0.68	0.53	0.46		
105	0.78	0.95	1.21	1.46	1.72	1.98	2.18	1.52	1.03	1.22	1.90	1.72	1.34	1.30	1.24	0.93	0.94		
110	1.17	1.33	1.61	1.77	2.25	2.74	2.28	1.82	1.34	1.47	1.81	2.29	2.03	1.50	1.14	0.97	1.07		
115	1.47	1.83	1.98	2.43	3.03	2.71	2.05	1.83	1.65	1.68	1.80	2.05	2.37	2.09	1.85	1.36	1.38		
120	1.61	2.58	2.42	2.51	2.73	2.20	2.10	1.99	1.89	1.89	1.90	2.01	1.99	2.17	2.15	2.14	1.84		
125	2.43	2.79	2.60	2.41	2.07	2.07	2.20	2.09	2.14	2.11	1.95	2.00	1.91	1.97	1.87	1.96	1.98		
130	2.03	2.89	2.51	2.22	2.10	2.22	2.33	2.05	2.32	2.14	1.93	2.08	2.00	2.00	1.92	2.03	1.70		
135	2.36	2.21	2.46	2.25	2.53	2.25	2.17	2.49	2.85	2.74	2.20	2.08	2.26	1.95	2.11	2.20	1.75		
140	2.34	2.63	2.59	2.61	2.42	2.72	2.74	2.31	2.30	2.23	2.38	2.69	2.23	2.34	2.31	2.30	2.00		
145	2.52	2.39	2.34	2.67	2.95	2.78	2.71	3.11	2.25	3.28	2.66	2.57	2.61	2.46	2.07	2.36	2.28		
150	2.61	2.27	2.93	2.33	2.99	2.92	3.02	3.47	2.28	2.29	2.81	2.71	2.88	2.40	2.40	2.11	2.07		
155	3.08	3.01	2.63	3.09	2.38	2.39	3.09	3.51	2.34	3.73	2.36	2.29	2.25	2.40	2.71	2.63	2.90		
160	2.81	2.83	2.62	2.66	3.09	3.04	2.50	2.28	2.21	2.33	2.33	2.41	2.37	2.15	2.24	2.88	3.11		
165	2.90	2.96	2.78	2.83	2.64	2.88	3.20	3.49	3.03	2.34	3.77	2.23	2.06	2.05	2.67	2.78	2.55		
170	2.79	2.79	2.89	2.96	3.11	3.30	3.33	3.27	2.69	1.97	2.03	2.00	1.97	2.01	2.02	2.11	2.23		
175	3.17	3.18	3.24	3.27	3.25	3.25	3.20	2.86	2.02	2.01	1.99	2.05	2.06	2.05	2.08	2.12	2.24		
180	2.15	2.20	2.21	2.26	2.30	2.29	2.30	2.23	2.33	2.40	2.38	2.24	2.29	2.26	2.29	2.25	2.23		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Feb. 05, 2025	-
Digital Power Meter	PF2010A	HZTE028-01	Aug. 08, 2024	Aug. 07, 2025
AC Power Supply	DPS1060	HZTE001-06	Aug. 08, 2024	Aug. 07, 2025
DC Power Supply	WY12010	HZTE004-03	Aug. 08, 2024	Aug. 07, 2025
Temperature recorder	JM624U	HZTE018-08	Aug. 08, 2024	Aug. 07, 2025
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 08, 2024	Aug. 07, 2025
Standard source	D908	HZTE012-01	Aug. 14, 2018	-
Integrate Sphere system	3M	HZTE015-04	Dec. 10, 2024	-
Digital Power Meter	WT210	HZTE008-01	Aug. 08, 2024	Aug. 07, 2025
AC Power Supply	PCR 500L	HZTE001-07	Aug. 08, 2024	Aug. 07, 2025
DC Power Supply	IT6154	HZTE004-04	Aug. 08, 2024	Aug. 07, 2025
Standard source	SCL-1400	HZTE012-06	Nov. 04, 2021	-
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 08, 2024	Aug. 07, 2025
Temperature Meter	TES1310	HZTE017-01	Aug. 08, 2024	Aug. 07, 2025

Table 8: 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 3 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 Tubes) 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 20 min, taken 10 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 expanded uncertainty is 2.1% 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 Tubes) 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 20 min, taken 10 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 2.3% 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.

*** End of Report ***

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