

LM-79-19 TEST REPORT

for

Industrial Lighting Products, LLC

3224 McCraney Loop, Sanford, FL, 32771

LED Retrofit-kits in Lithonia 2GT8 lensed 2x4

Model: ULB3-30L-U-35-L4

ULB3-30L-U-35-L4-MWS

30LB/3F/835/U/A4

30LB/3F/835/U/A4/MWS

Laboratory: Leading Testing Laboratories

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Report No.: HZ250300141

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

Review by:

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April Zou

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May 28, 2025

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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: **ULB3-30L-U-35-L4**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
128.8	4992.7	38.75	0.9963
CCT (K)	CRI	Stabilization Time (Light & Power)	
3504	82.8	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. 20, 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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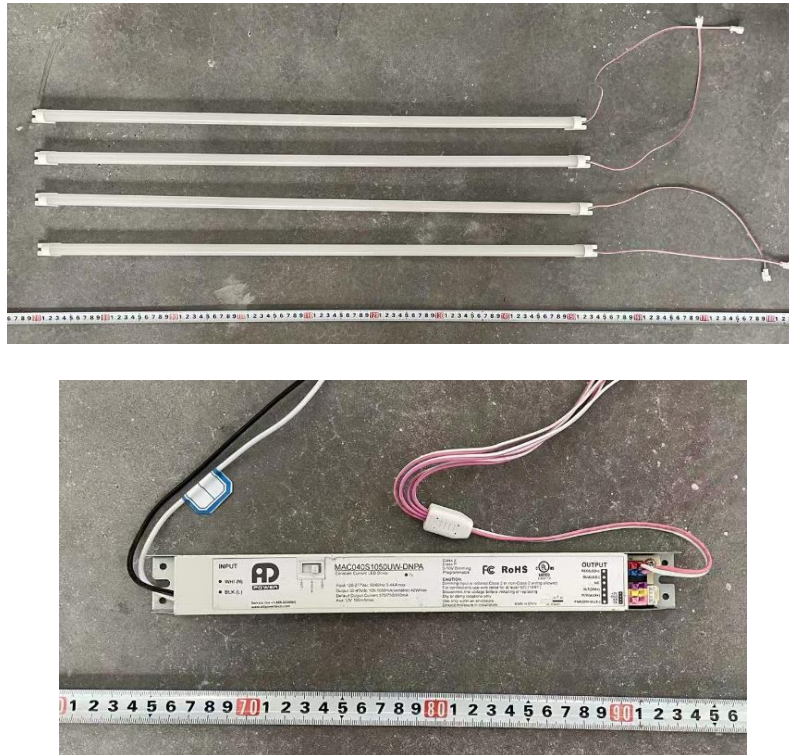


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x4

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB3-30L-U-35-L4	ULB3-30L-U-35-L4-MWS
	30LB/3F/835/U/A4	30LB/3F/835/U/A4/MWS
Electrical Ratings	: 120-277V, 50/60Hz	
Product Description	: Field-Adjustable 40W/36W/32W, 3500K LED Tube supplied by a LED driver: MAC040S1050UW-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)	0.324	0.145
Power Factor	0.9963	0.9617
Test Power (W)	38.75	38.52
THD A%	7.23	14.98
Luminous Efficacy (lm/W)	128.8	130.1
Total Luminous Flux (lm)	4992.7	5011.6
Color Rendering Index (CRI)	82.8	
R9	9.8	
Correlated Color Temperature (CCT)(K)	3504	
Chromaticity Chroma x	0.4036	
Chromaticity Chroma y	0.3870	
Chromaticity Chroma u	0.2362	
Chromaticity Chroma v	0.3396	
Duv	-0.0013	
Chromaticity Chroma u'	0.2362	
Chromaticity Chroma v'	0.5095	

Special Color Rendering Indices	
R1	81.4
R2	89.1
R3	95
R4	81.9
R5	81.4
R6	85.3
R7	84.9
R8	63.2
R9	9.8
R10	74.5
R11	81.3
R12	64.2
R13	83.2
R14	97.3

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)	0.324
Power Factor	0.9960
Power (W)	38.78
Luminous Efficacy (lm/W)	129.1
Total Luminous Flux (lm)	5006.5
Beam Angle (°)	95.2 (0°-180°) / 94.5 (90°-270°)
Center Beam Candle Power (cd)	2261
Maximum Beam Candle Power (cd)	2268 (At: C=70.0, Gamma=1.5)
Spacing Criteria	1.20 (0°-180°) / 1.25 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	88.35%
Zonal Lumens in the 60 °-90 °Zone	11.43%
Zonal Lumens in the 90 °-120 °Zone	0.08%
Zonal Lumens in the 120 °-180 °Zone	0.14%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

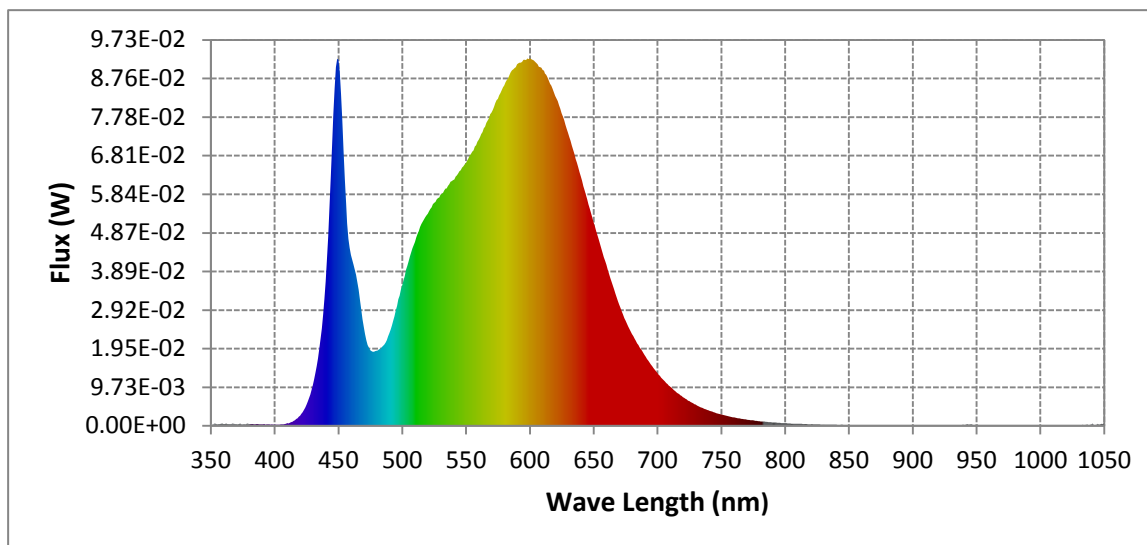
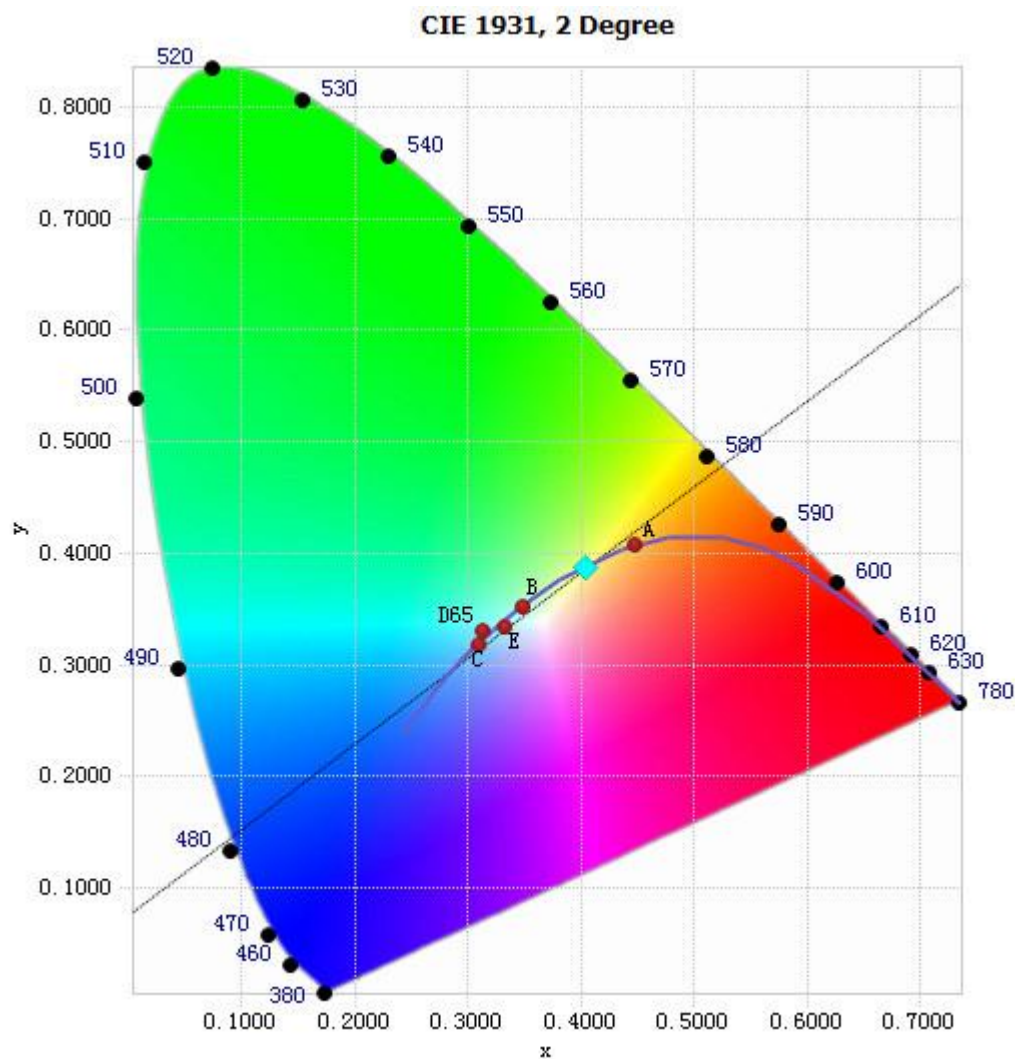


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.75E-04	485	2.01E-02	590	9.12E-02	695	1.55E-02
385	3.97E-04	490	2.34E-02	595	9.22E-02	700	1.33E-02
390	3.57E-04	495	2.91E-02	600	9.27E-02	705	1.15E-02
395	3.53E-04	500	3.54E-02	605	9.15E-02	710	9.85E-03
400	2.92E-04	505	4.14E-02	610	8.97E-02	715	8.44E-03
405	3.76E-04	510	4.64E-02	615	8.70E-02	720	7.25E-03
410	6.60E-04	515	5.08E-02	620	8.32E-02	725	6.22E-03
415	1.22E-03	520	5.35E-02	625	7.88E-02	730	5.32E-03
420	2.54E-03	525	5.62E-02	630	7.38E-02	735	4.53E-03
425	5.26E-03	530	5.83E-02	635	6.85E-02	740	3.88E-03
430	1.03E-02	535	5.98E-02	640	6.29E-02	745	3.34E-03
435	1.94E-02	540	6.19E-02	645	5.71E-02	750	2.84E-03
440	3.64E-02	545	6.41E-02	650	5.13E-02	755	2.46E-03
445	7.05E-02	550	6.62E-02	655	4.59E-02	760	2.12E-03
450	9.22E-02	555	6.91E-02	660	4.06E-02	765	1.82E-03
455	6.20E-02	560	7.21E-02	665	3.54E-02	770	1.56E-03
460	4.31E-02	565	7.54E-02	670	3.06E-02	775	1.37E-03
465	3.62E-02	570	7.89E-02	675	2.65E-02	780	1.16E-03
470	2.50E-02	575	8.25E-02	680	2.31E-02		
475	1.91E-02	580	8.58E-02	685	2.03E-02		
480	1.89E-02	585	8.91E-02	690	1.79E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4036, 0.3870)

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

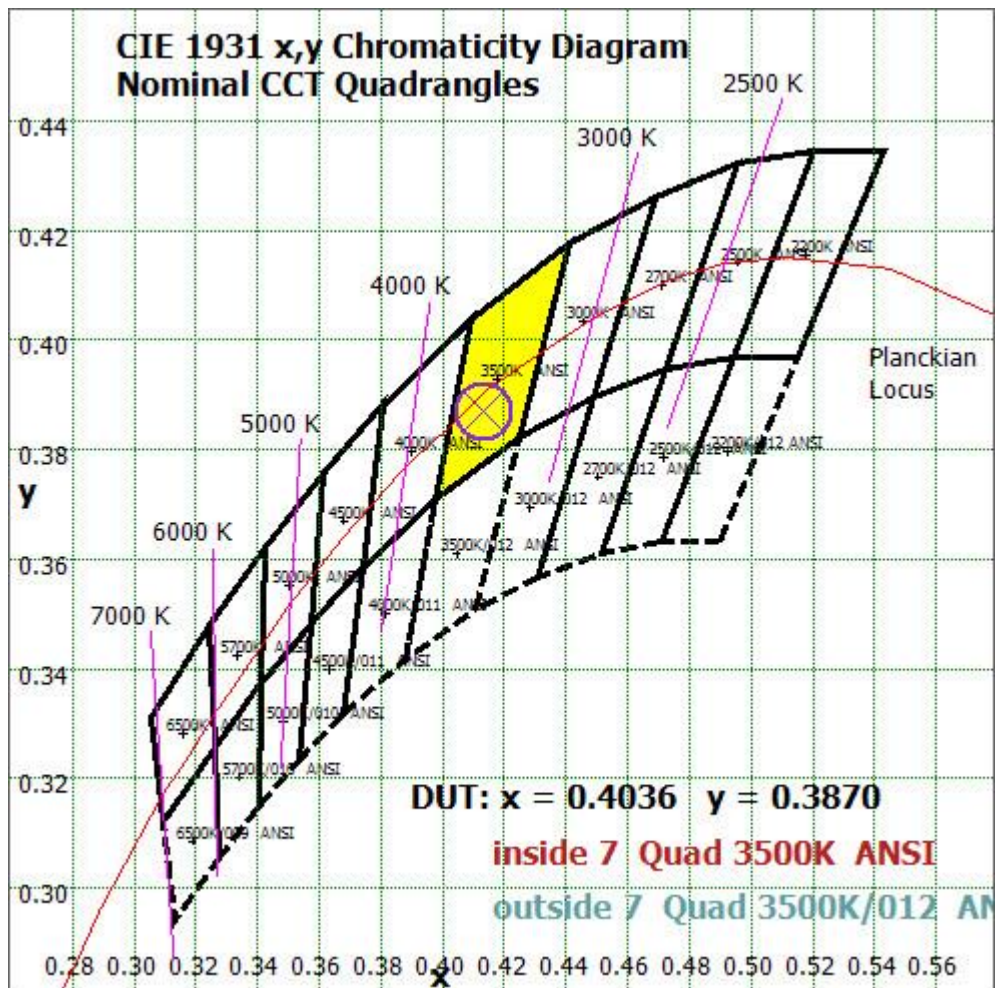


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

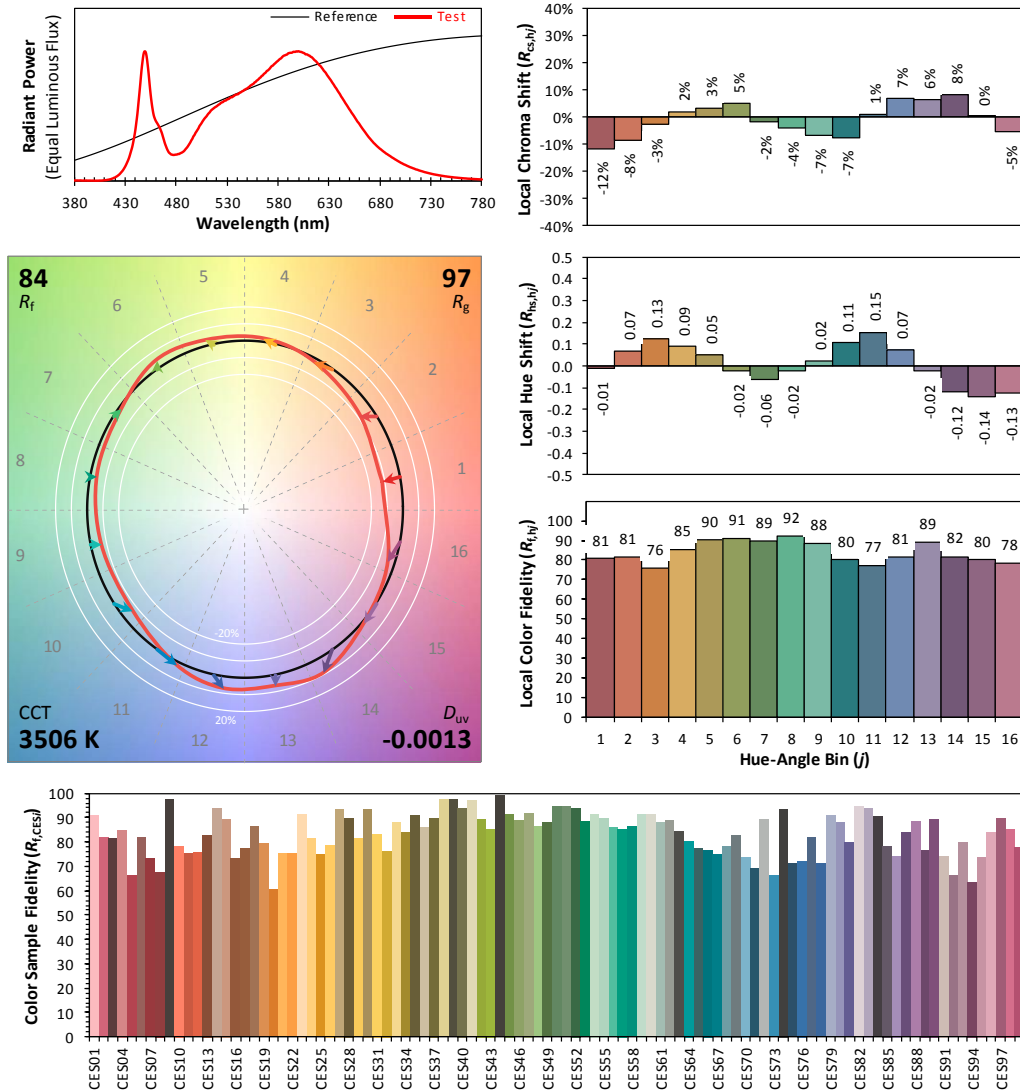
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/20

Model: ULB3-30L-U-35-L4



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

x 0.4036
 y 0.3870
 u' 0.2362
 v' 0.5095

CIE 13.3-1995
(CRI)

R_a 83
 R_g 10

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	213.897	4.27%
10- 20	611.733	12.22%
20- 30	921.667	18.41%
30- 40	1086.129	21.69%
40- 50	985.962	19.69%
50- 60	603.797	12.06%
60- 70	324.711	6.49%
70- 80	182.548	3.65%
80- 90	65.033	1.30%
90-100	0.917	0.02%
100-110	1.416	0.03%
110-120	1.544	0.03%
120-130	1.839	0.04%
130-140	1.857	0.04%
140-150	1.52	0.03%
150-160	1.059	0.02%
160-170	0.669	0.01%
170-180	0.211	0.00%
Total	5006.5	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	4423.185	88.35%
60- 90	572.292	11.43%
0-90	4995.477	99.78%
90- 180	11.032	0.22%
0- 180	5006.5	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

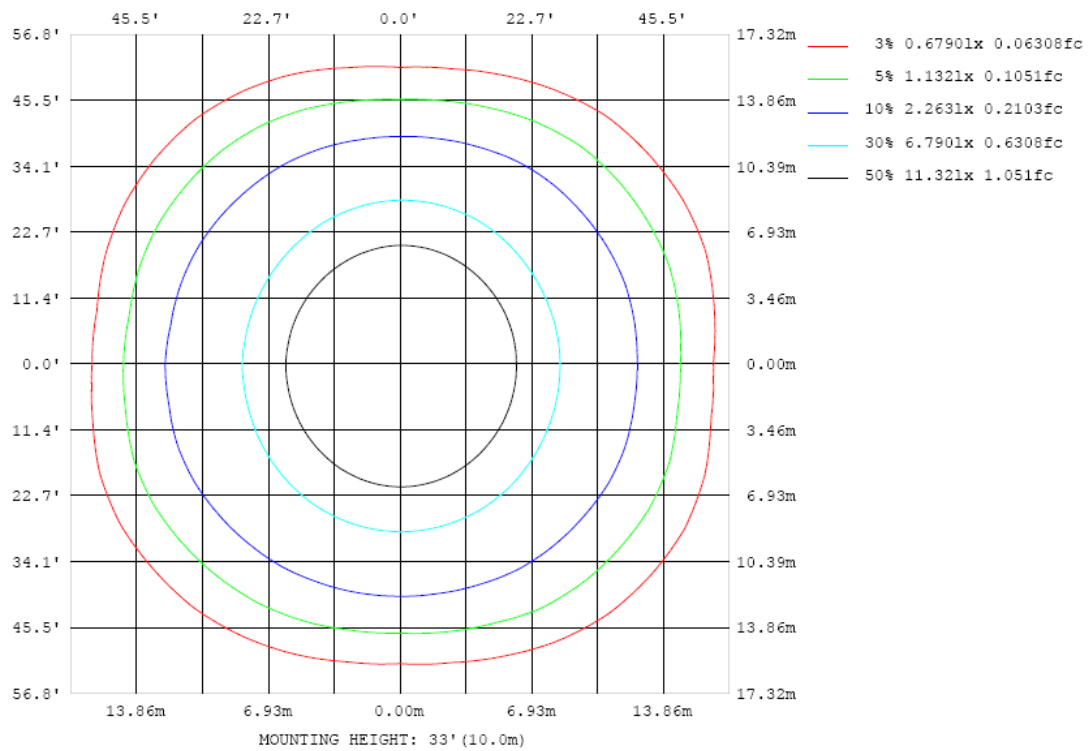


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

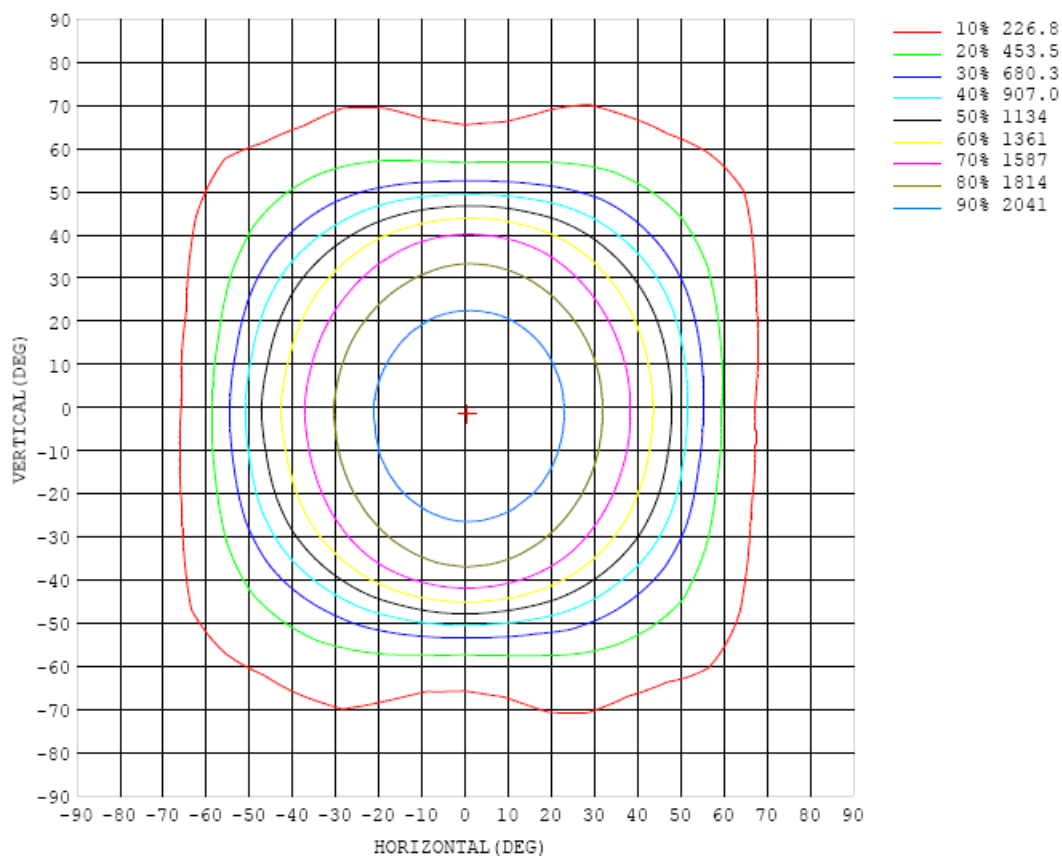


Chart 6: Isocandela Plot

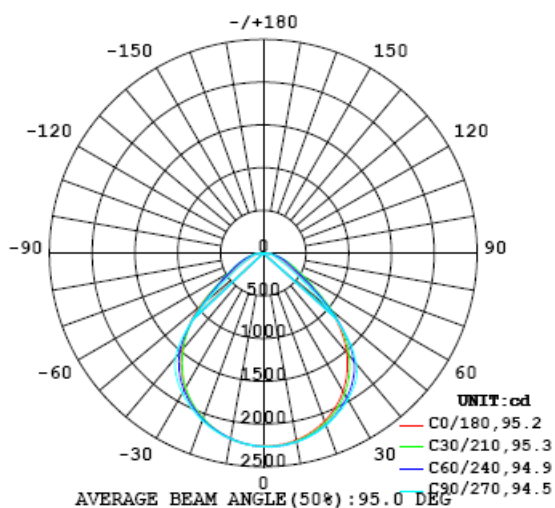


Chart 7: Polar Candela Distribution

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	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261
5	2248	2259	2255	2261	2257	2263	2264	2263	2264	2264	2264	2257	2253	2253	2256	2254	2255	2248	2243
10	2226	2228	2231	2231	2234	2239	2238	2242	2242	2241	2238	2234	2231	2232	2226	2214	2213	2205	2207
15	2165	2176	2177	2185	2190	2198	2204	2203	2206	2207	2203	2193	2184	2179	2171	2165	2158	2152	2147
20	2098	2102	2109	2114	2120	2132	2136	2143	2143	2141	2139	2131	2122	2110	2102	2086	2080	2065	2062
25	1988	2003	2007	2020	2034	2046	2058	2062	2068	2070	2063	2046	2033	2023	2004	1985	1972	1960	1958
30	1870	1877	1884	1902	1913	1936	1951	1968	1972	1975	1968	1953	1933	1908	1885	1867	1846	1830	1822
35	1704	1720	1731	1747	1771	1799	1826	1848	1866	1871	1859	1832	1803	1770	1740	1704	1683	1667	1667
40	1522	1529	1535	1558	1582	1619	1649	1672	1682	1688	1678	1651	1626	1590	1547	1519	1491	1475	1475
45	1286	1295	1309	1327	1341	1353	1371	1370	1371	1375	1365	1354	1339	1318	1303	1287	1264	1242	1249
50	1007	1012	1038	1045	1026	1019	1011	978	954	950	955	954	974	977	988	1002	997	965	971
55	689	700	747	754	735	726	704	640	604	573	590	626	660	676	695	713	712	669	650
60	433	451	511	541	535	519	478	426	381	358	375	420	452	483	494	501	483	428	392
65	275	297	362	408	381	364	351	313	264	239	248	298	347	352	355	367	351	282	244
70	182	201	262	306	263	261	275	246	198	169	175	217	262	261	248	263	259	190	163
75	143	152	202	212	193	178	200	188	147	128	131	161	191	178	169	183	195	143	124
80	110	118	156	138	124	111	131	131	111	99.4	100.0	114	127	113	98.3	123	139	112	95.6
85	65.6	70.6	83.7	74.9	61.6	57.3	63.7	66.2	61.7	56.1	55.6	60.6	62.1	58.8	54.5	66.0	67.2	63.8	55.9
90	4.76	2.28	4.80	2.76	6.30	4.15	3.46	2.79	2.27	3.61	2.31	4.12	4.37	1.66	4.32	1.71	4.43	2.42	0.55
95	0.60	0.79	1.19	0.47	1.28	0.67	0.41	0.29	0.24	0.24	0.26	0.28	0.34	0.41	0.48	0.56	0.67	0.60	0.56
100	1.17	1.55	1.68	0.77	1.77	1.57	1.30	1.05	1.04	1.18	1.38	1.60	1.92	1.88	1.68	1.03	0.65	1.01	0.61
105	1.63	1.53	1.85	0.85	1.29	1.17	1.05	1.33	1.68	1.98	2.00	1.82	1.39	1.17	1.33	1.55	0.71	1.09	1.16
110	1.27	1.52	1.81	0.89	1.31	1.18	1.09	0.99	0.94	0.99	1.08	1.22	1.48	1.79	2.12	2.46	0.82	1.45	1.37
115	1.33	1.47	1.32	1.00	1.40	1.37	1.42	1.37	1.41	1.49	1.66	1.89	2.20	2.60	2.93	2.44	0.93	1.52	1.65
120	1.46	1.54	1.29	1.06	1.56	1.78	1.94	2.01	2.16	2.24	2.41	2.70	3.06	3.10	2.84	2.44	1.22	1.89	2.00
125	1.61	1.83	1.41	1.39	1.80	1.96	2.18	2.40	2.77	2.89	3.06	3.09	3.02	2.95	2.81	2.59	1.20	2.22	2.19
130	1.71	2.07	1.78	1.25	2.14	1.93	2.29	2.46	2.65	2.67	2.86	2.86	2.95	2.88	2.72	2.88	1.25	2.39	1.39
135	1.85	2.25	2.08	1.37	2.22	2.22	2.23	2.35	2.48	2.62	2.67	2.87	3.05	2.91	3.09	1.33	2.49	3.10	2.10
140	1.57	2.08	2.30	1.97	1.42	2.34	2.37	2.39	2.43	2.50	2.74	2.95	2.91	3.22	2.24	1.78	2.77	3.39	2.05
145	1.53	2.22	2.37	2.10	1.56	1.57	2.10	2.45	2.47	2.61	2.94	2.97	3.05	1.93	1.44	2.62	3.09	3.20	2.09
150	1.55	1.98	2.28	2.44	2.20	1.79	1.55	1.76	1.73	1.98	1.96	1.67	1.63	1.82	2.45	2.89	3.21	3.29	2.05
155	1.73	2.14	2.37	2.38	2.26	2.09	1.96	1.85	1.84	1.69	1.81	1.93	2.08	2.19	1.91	2.82	3.27	2.95	1.95
160	1.56	1.87	2.16	2.38	2.47	2.50	2.25	2.21	2.21	2.10	2.18	2.24	2.38	2.61	2.79	1.97	2.00	1.99	1.72
165	1.73	1.87	1.93	2.39	2.45	2.52	2.46	2.28	2.45	2.50	2.54	2.54	2.63	2.78	2.67	2.56	2.24	2.08	1.69
170	1.86	1.99	2.03	2.22	2.48	2.44	2.40	2.48	2.45	2.48	2.53	2.60	2.67	2.48	2.57	2.40	2.34	2.10	1.80
175	2.05	2.14	2.22	2.30	2.32	2.28	2.15	2.24	2.37	2.35	2.33	2.19	2.15	2.20	2.24	2.21	2.19	2.21	2.00
180	2.00	2.04	2.06	2.05	2.04	2.03	1.97	2.05	2.08	1.85	1.83	2.04	2.11	2.09	2.13	2.16	2.16	2.01	2.00

Table 6: Luminous Intensity Data

Table--2		UNIT: cd																	
γ (DEG)	C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	
0		2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	2261	
5		2250	2245	2244	2238	2246	2244	2246	2244	2246	2249	2243	2244	2250	2251	2248	2257	2251	
10		2206	2200	2202	2201	2200	2205	2202	2206	2204	2206	2207	2210	2211	2214	2220	2225	2226	
15		2147	2140	2140	2134	2144	2141	2151	2151	2158	2160	2157	2158	2160	2164	2161	2167	2169	
20		2061	2054	2054	2058	2063	2073	2074	2080	2083	2087	2085	2089	2092	2090	2089	2097	2095	
25		1949	1945	1949	1950	1965	1967	1982	1985	1994	1999	1994	1994	1992	1996	1995	1993	1995	
30		1820	1813	1818	1825	1835	1856	1864	1883	1890	1892	1886	1883	1877	1870	1865	1867	1865	
35		1653	1647	1654	1664	1686	1706	1737	1752	1769	1773	1760	1746	1732	1721	1709	1710	1711	
40		1458	1453	1456	1471	1491	1528	1553	1580	1594	1595	1586	1573	1548	1527	1512	1510	1516	
45		1223	1219	1226	1225	1233	1242	1253	1254	1270	1283	1285	1301	1299	1288	1280	1284	1284	
50		937	944	943	927	913	909	887	865	858	876	909	955	979	989	1007	1021	1013	
55		635	657	668	658	654	632	597	549	527	549	595	653	702	716	728	741	717	
60		399	447	477	483	479	455	422	371	342	359	406	453	498	516	528	519	474	
65		259	319	353	344	341	345	315	259	234	249	291	345	362	366	388	382	322	
70		177	235	263	240	236	257	234	190	171	183	225	262	268	263	280	289	222	
75		134	182	191	166	161	180	172	148	139	142	173	197	185	182	204	215	171	
80		108	136	126	106	100	115	119	108	103	108	124	132	122	112	142	152	146	
85		64.8	70.1	65.5	54.3	51.1	54.3	54.6	49.8	47.0	53.4	61.1	63.3	61.0	56.7	73.3	83.3	81.9	
90		0.74	1.00	0.78	0.51	0.43	0.32	0.26	0.19	0.17	0.18	0.20	0.26	0.27	0.42	0.66	0.86	1.03	
95		0.62	0.78	1.24	1.02	0.87	0.69	0.60	0.47	0.40	0.34	0.33	0.38	0.40	0.55	0.68	0.73	0.80	
100		0.69	0.78	1.39	1.95	1.99	1.80	1.71	1.76	1.63	1.33	0.85	0.86	0.87	1.04	0.97	0.98	1.02	
105		1.11	1.02	1.23	1.21	1.51	1.87	1.88	1.76	1.65	1.48	1.06	0.98	1.04	1.18	1.08	1.19	1.20	
110		1.58	1.48	1.37	1.36	1.37	1.33	1.16	1.09	1.11	1.07	1.02	1.11	1.13	1.32	1.22	1.41	1.33	
115		1.75	1.68	1.60	1.57	1.59	1.44	1.35	1.31	1.27	1.25	1.22	1.27	1.29	1.44	1.36	1.68	1.49	
120		2.06	1.80	2.15	1.92	1.72	1.78	1.51	1.44	1.42	1.40	1.38	1.44	1.52	1.62	1.51	1.71	1.64	
125		2.13	2.25	2.41	2.64	2.07	1.97	1.93	1.70	1.64	1.63	1.63	1.76	1.75	1.92	1.75	1.71	1.72	
130		1.84	2.72	1.41	2.99	2.82	2.31	2.23	2.17	2.03	2.00	2.03	2.02	2.07	2.32	1.80	1.75	1.88	
135		2.75	2.77	1.88	2.36	3.28	2.94	2.66	2.62	2.54	2.48	2.43	2.48	2.54	2.38	1.78	2.12	2.10	
140		2.67	3.06	3.05	1.89	2.90	3.14	3.05	2.97	2.88	2.86	2.87	2.74	2.59	1.91	1.90	2.36	2.08	
145		2.78	2.97	3.20	3.29	2.05	2.27	2.87	2.96	2.93	2.96	2.72	2.32	1.99	1.80	2.14	2.18	2.16	
150		2.79	3.06	3.14	3.55	2.78	1.77	2.16	2.23	2.31	2.20	2.11	1.84	2.04	2.25	2.31	2.19	1.94	
155		2.17	2.86	3.06	2.39	2.13	3.17	3.16	2.66	2.19	2.15	2.20	2.28	2.60	2.35	2.40	2.35	2.14	
160		1.63	1.78	1.94	2.25	3.11	3.12	3.08	3.18	3.06	2.85	2.64	2.66	2.58	2.54	2.41	2.30	1.99	
165		1.73	1.86	2.12	2.32	2.54	2.75	2.84	2.83	2.67	2.62	2.61	2.54	2.59	2.55	2.45	2.34	1.94	
170		1.80	1.85	2.03	2.28	2.31	2.27	2.40	2.44	2.49	2.34	2.42	2.40	2.38	2.41	2.43	2.34	1.89	
175		2.00	2.03	2.07	2.16	2.18	2.24	2.27	2.21	2.34	2.33	2.41	2.39	2.03	2.11	2.21	2.13	2.04	
180		2.00	2.03	2.05	2.06	2.06	2.08	2.05	2.06	1.95	1.96	1.92	1.99	2.04	2.06	2.05	2.04	2.05	

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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