

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: ULB4-40L-U-35-L2

ULB4-40L-U-35-L2-MWS

40LB/4F/835/U/A2

40LB/4F/835/U/A2/MWS

Laboratory: Leading Testing Laboratories

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Report No.: HZ25030014s

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

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: **ULB4-40L-U-35-L2**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
126.8	5003.3	39.45	0.9962
CCT (K)	CRI	Stabilization Time (Light & Power)	
3488	82.9	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. 26, 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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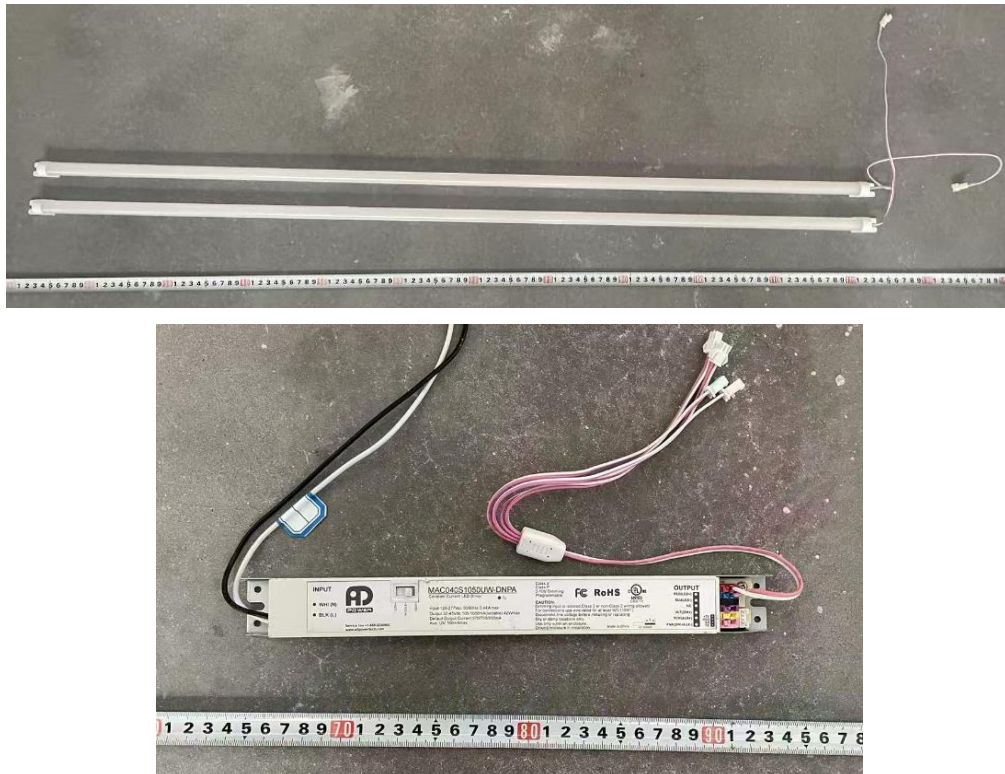


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x4

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB4-40L-U-35-L2	ULB4-40L-U-35-L2-MWS
	40LB/4F/835/U/A2	40LB/4F/835/U/A2/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)	0.330	0.147
Power Factor	0.9962	0.9620
Test Power (W)	39.45	39.20
THD A%	7.11	15.02
Luminous Efficacy (lm/W)	126.8	128.2
Total Luminous Flux (lm)	5003.3	5024.5
Color Rendering Index (CRI)	82.9	
R9	10.4	
Correlated Color Temperature (CCT)(K)	3488	
Chromaticity Chroma x	0.4043	
Chromaticity Chroma y	0.3868	
Chromaticity Chroma u	0.2367	
Chromaticity Chroma v	0.3397	
Duv	-0.0015	
Chromaticity Chroma u'	0.2367	
Chromaticity Chroma v'	0.5095	

Special Color Rendering Indices	
R1	81.6
R2	89.4
R3	95.1
R4	82
R5	81.6
R6	85.6
R7	84.8
R8	63.2
R9	10.4
R10	75
R11	81.4
R12	64.5
R13	83.4
R14	97.4

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)	0.331
Power Factor	0.9960
Power (W)	39.49
Luminous Efficacy (lm/W)	127.1
Total Luminous Flux (lm)	5019.7
Beam Angle (°)	93.9 (0°-180°) / 94.4 (90°-270°)
Center Beam Candle Power (cd)	2279
Maximum Beam Candle Power (cd)	2282 (At: C=50.0, Gamma=2.0)
Spacing Criteria	1.20 (0°-180°) / 1.26 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	88.43%
Zonal Lumens in the 60 °-90 °Zone	11.30%
Zonal Lumens in the 90 °-120 °Zone	0.09%
Zonal Lumens in the 120 °-180 °Zone	0.18%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

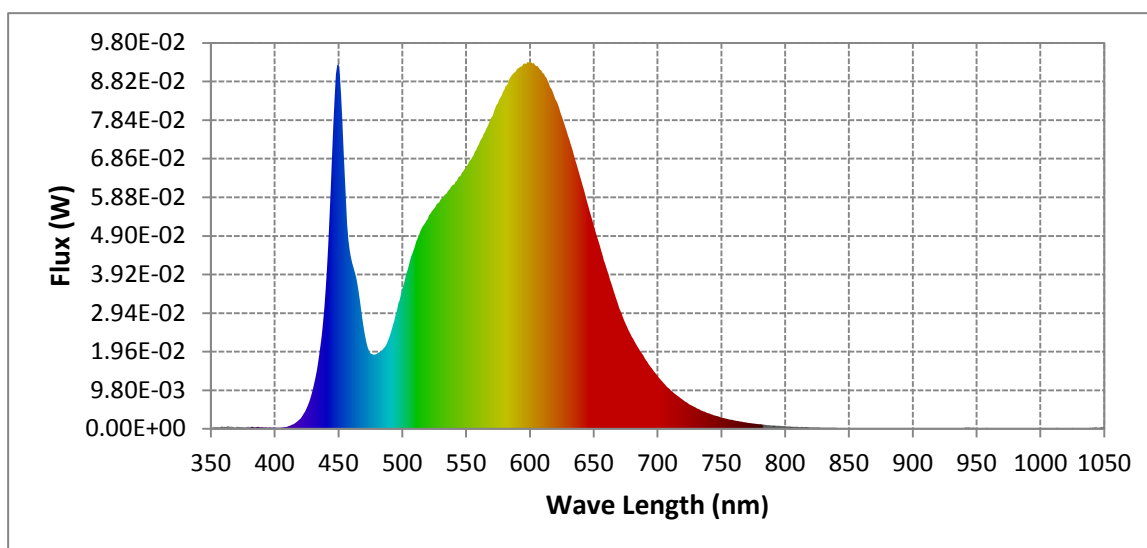
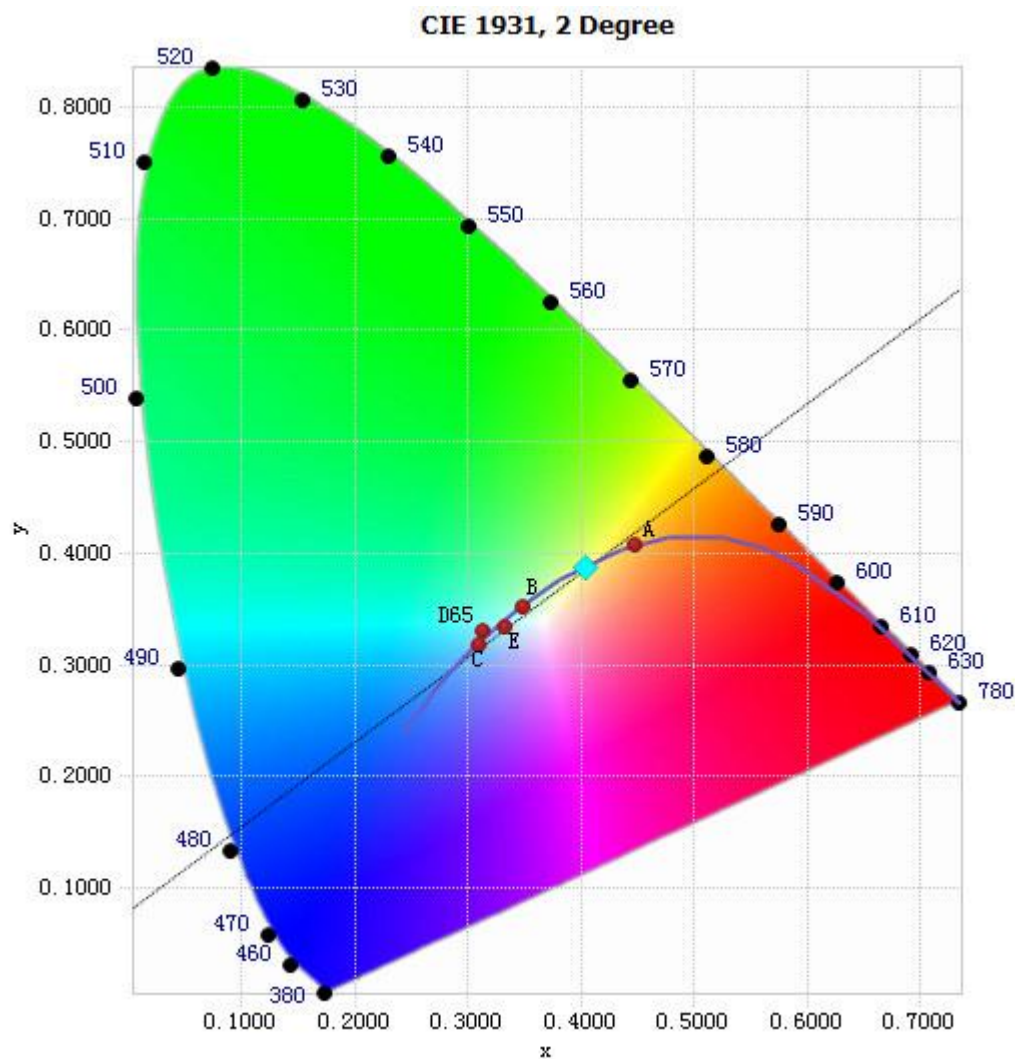


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	5.11E-04	485	2.02E-02	590	9.14E-02	695	1.56E-02
385	3.96E-04	490	2.33E-02	595	9.27E-02	700	1.35E-02
390	4.14E-04	495	2.91E-02	600	9.32E-02	705	1.16E-02
395	2.94E-04	500	3.55E-02	605	9.20E-02	710	9.96E-03
400	3.24E-04	505	4.12E-02	610	9.02E-02	715	8.56E-03
405	3.13E-04	510	4.64E-02	615	8.77E-02	720	7.35E-03
410	5.42E-04	515	5.08E-02	620	8.38E-02	725	6.25E-03
415	1.16E-03	520	5.33E-02	625	7.94E-02	730	5.37E-03
420	2.51E-03	525	5.60E-02	630	7.44E-02	735	4.56E-03
425	5.13E-03	530	5.82E-02	635	6.90E-02	740	3.92E-03
430	1.01E-02	535	5.97E-02	640	6.34E-02	745	3.41E-03
435	1.89E-02	540	6.20E-02	645	5.75E-02	750	2.86E-03
440	3.54E-02	545	6.41E-02	650	5.17E-02	755	2.48E-03
445	6.94E-02	550	6.61E-02	655	4.64E-02	760	2.16E-03
450	9.28E-02	555	6.90E-02	660	4.09E-02	765	1.85E-03
455	6.38E-02	560	7.21E-02	665	3.57E-02	770	1.58E-03
460	4.35E-02	565	7.54E-02	670	3.07E-02	775	1.35E-03
465	3.69E-02	570	7.91E-02	675	2.67E-02	780	1.17E-03
470	2.56E-02	575	8.26E-02	680	2.33E-02		
475	1.93E-02	580	8.61E-02	685	2.05E-02		
480	1.90E-02	585	8.94E-02	690	1.80E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4043, 0.3868)

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

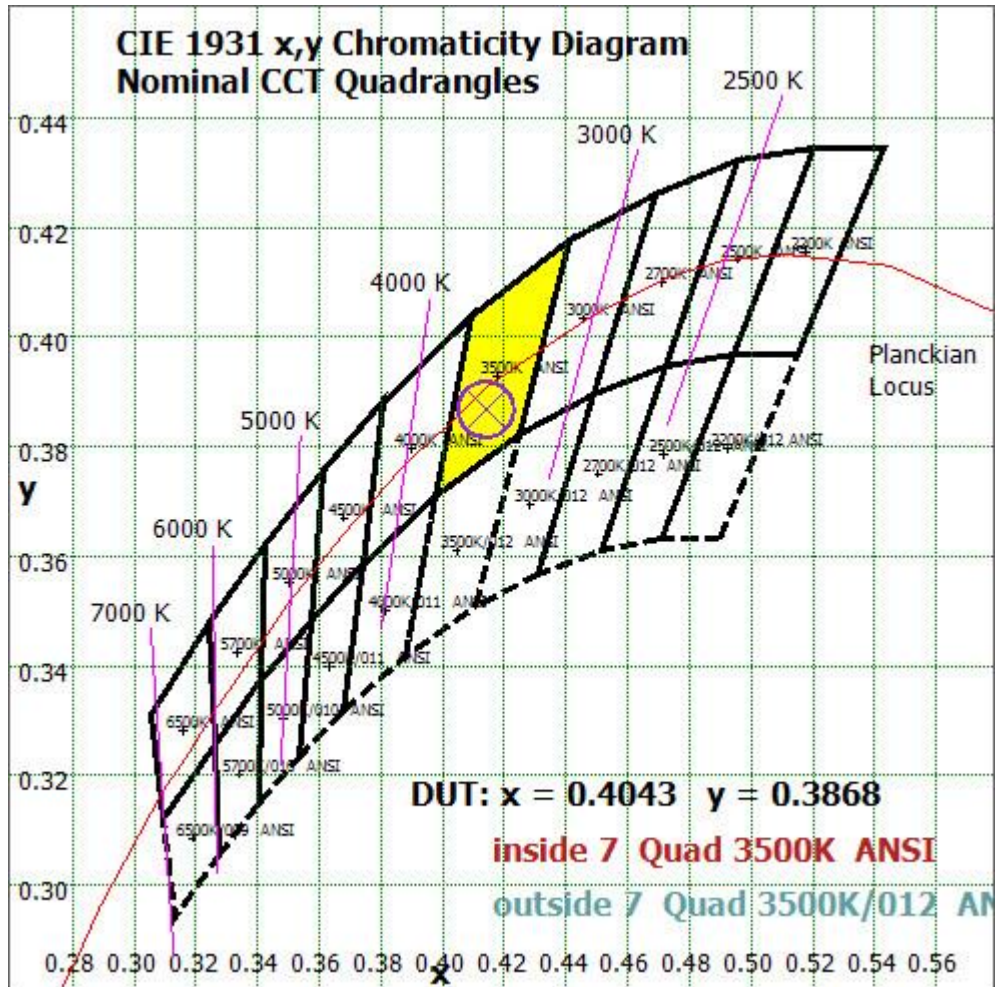


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram



Color Rendition Report – Sphere Spectroradiometer Method

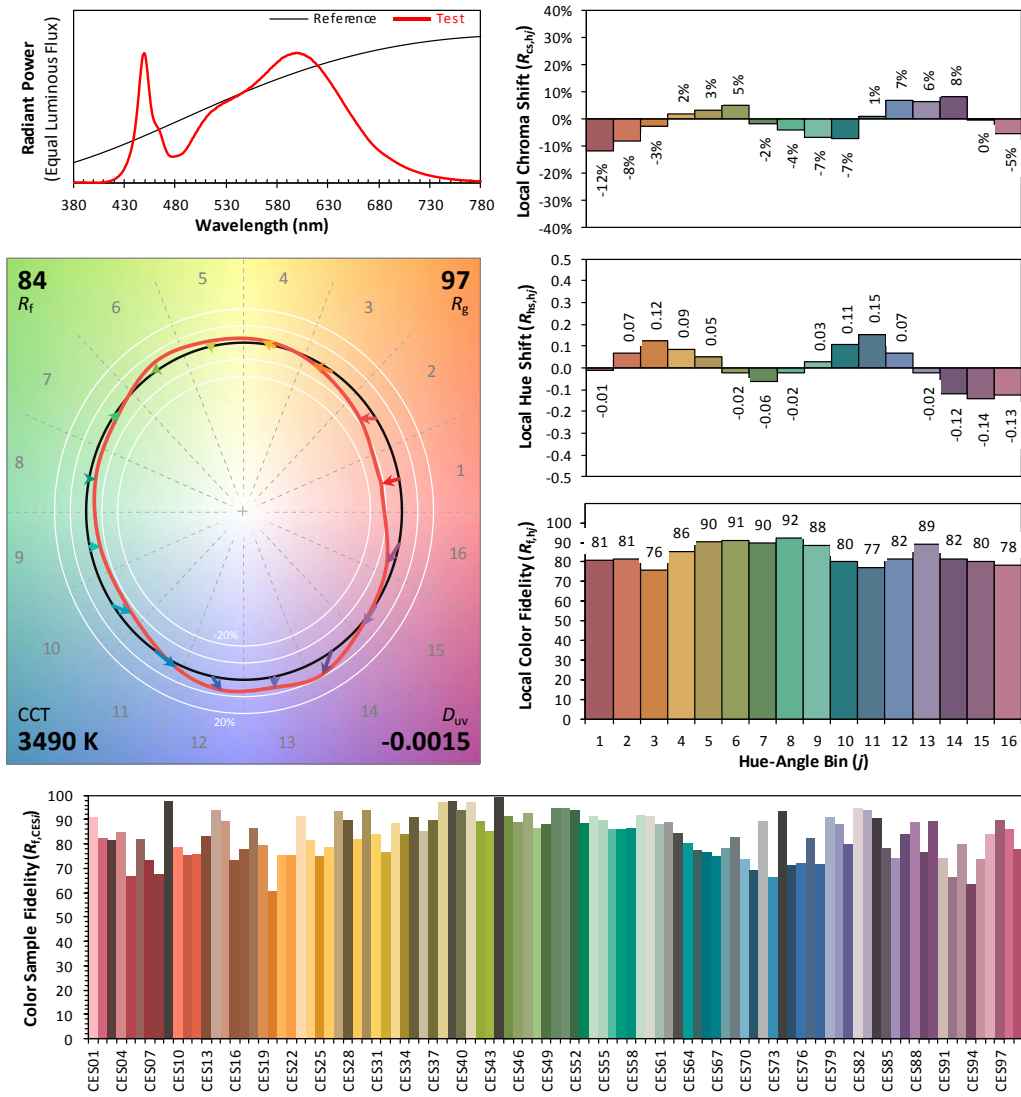
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/26

Model: ULB4-40L-U-35-L2



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.	x	0.4043	CIE 13.3-1995 (CRI) R_a 83 R_g 11
	y	0.3868	
	u'	0.2367	
	v'	0.5095	

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	215.538	4.29%
10- 20	616.662	12.28%
20- 30	930.354	18.53%
30- 40	1095.625	21.83%
40- 50	983.655	19.60%
50- 60	596.864	11.89%
60- 70	322.272	6.42%
70- 80	181.377	3.61%
80- 90	63.644	1.27%
90-100	1.28	0.03%
100-110	1.689	0.03%
110-120	1.672	0.03%
120-130	2.023	0.04%
130-140	2.289	0.05%
140-150	2.136	0.04%
150-160	1.511	0.03%
160-170	0.869	0.02%
170-180	0.243	0.00%
Total	5019.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	4438.698	88.43%
60- 90	567.293	11.30%
0-90	5005.991	99.73%
90- 180	13.712	0.27%
0- 180	5019.7	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

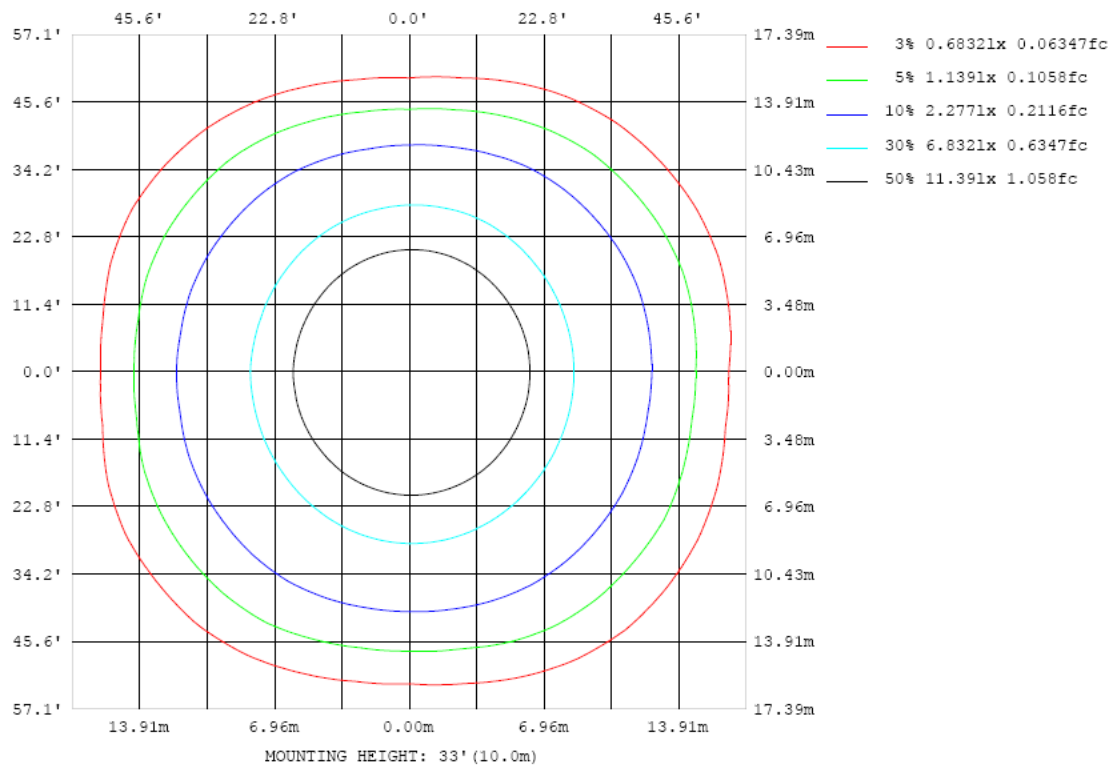


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

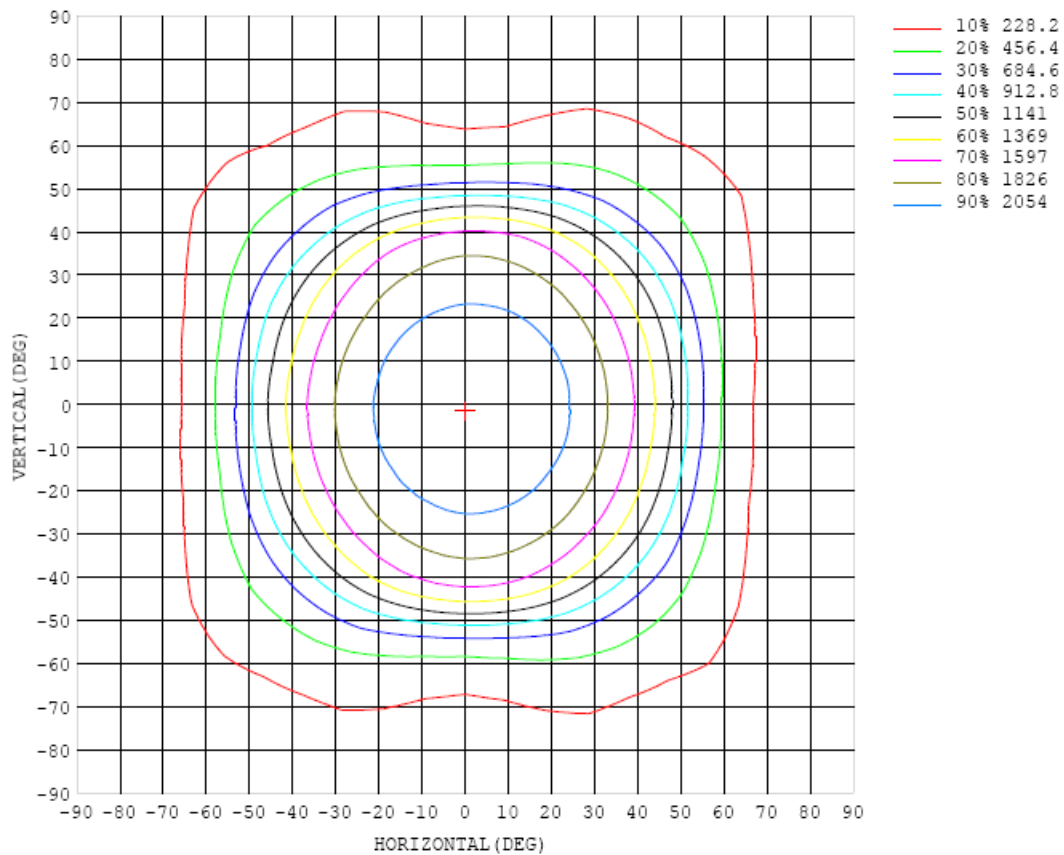


Chart 6: Isocandela Plot

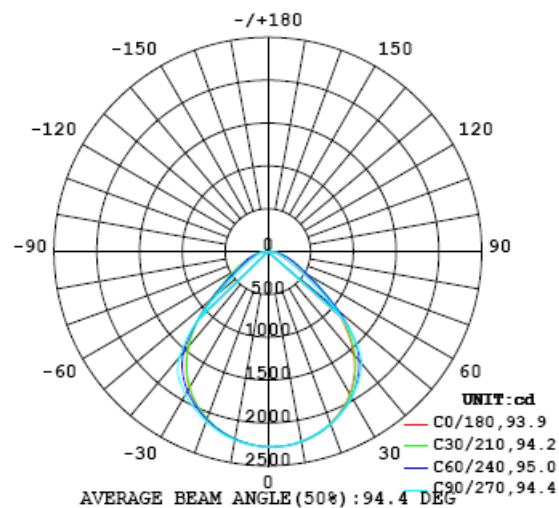


Chart 7: Polar Candela Distribution

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	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279
5	2275	2281	2274	2278	2281	2278	2275	2277	2270	2273	2270	2273	2259	2271	2262	2262	2268	2259	2260
10	2250	2253	2247	2252	2254	2260	2251	2251	2249	2250	2238	2238	2235	2238	2231	2230	2227	2219	2225
15	2203	2211	2206	2210	2214	2209	2207	2209	2202	2197	2199	2195	2184	2182	2175	2170	2166	2164	2162
20	2134	2139	2138	2142	2142	2143	2141	2145	2139	2141	2124	2125	2108	2113	2099	2093	2091	2077	2079
25	2036	2048	2042	2046	2053	2062	2059	2062	2062	2060	2052	2038	2029	2015	2000	1988	1980	1973	1973
30	1916	1924	1925	1934	1942	1952	1959	1969	1961	1960	1950	1941	1911	1903	1878	1861	1846	1834	1834
35	1761	1768	1763	1774	1798	1814	1827	1840	1848	1848	1826	1806	1777	1749	1716	1689	1676	1660	1665
40	1560	1566	1566	1590	1612	1639	1659	1686	1698	1700	1680	1651	1604	1561	1515	1486	1459	1446	1451
45	1318	1315	1327	1345	1369	1394	1421	1434	1427	1422	1403	1386	1350	1311	1268	1234	1206	1177	1185
50	1021	1017	1034	1058	1067	1076	1077	1062	1030	1012	1007	1016	1021	1001	971	951	924	886	887
55	705	706	742	765	765	771	755	709	654	631	641	679	724	717	704	687	659	601	590
60	433	447	498	534	551	554	526	480	427	397	414	452	488	512	504	499	460	397	375
65	267	287	350	394	398	395	388	351	294	268	283	330	363	365	360	370	337	270	242
70	175	193	258	291	277	282	292	258	213	189	210	248	274	268	257	273	255	189	168
75	129	142	195	213	190	191	212	190	164	147	160	189	204	183	184	197	195	149	137
80	100	112	148	146	123	122	141	137	125	116	123	134	139	118	115	131	137	118	98.7
85	58.1	69.1	82.0	81.0	67.5	67.7	75.0	76.8	71.2	66.8	70.3	73.8	68.8	60.0	54.9	63.5	67.2	59.2	51.6
90	4.59	4.62	5.88	5.63	4.30	4.32	3.01	5.86	3.95	3.25	2.82	2.88	2.58	2.22	3.97	4.33	2.77	2.19	1.28
95	0.71	0.93	1.25	1.10	0.73	0.73	0.59	0.48	0.39	0.41	0.38	0.41	0.52	0.62	0.79	0.94	0.99	0.97	0.78
100	0.77	0.73	0.75	1.07	1.93	2.15	1.93	1.90	2.38	2.43	2.25	2.16	2.28	2.31	1.68	1.08	1.07	1.13	1.28
105	1.15	1.32	0.99	1.14	1.19	1.41	1.41	1.31	1.51	1.56	1.45	1.12	1.24	1.20	1.26	1.14	1.37	1.43	1.70
110	1.30	1.53	1.30	1.40	1.44	1.40	1.34	1.34	1.23	1.31	1.23	1.17	1.15	1.20	1.46	1.36	1.65	2.07	1.96
115	1.64	1.70	1.70	1.65	1.83	1.66	1.57	1.44	1.35	1.24	1.23	1.25	1.28	1.42	1.74	1.46	2.12	2.02	2.46
120	2.14	2.30	1.99	1.96	2.09	2.05	1.81	1.63	1.54	1.52	1.50	1.51	1.58	1.60	2.01	1.72	2.42	2.42	2.59
125	2.44	2.71	2.01	2.71	2.42	2.55	2.09	1.94	1.82	1.82	1.77	1.76	1.87	2.16	2.27	2.26	2.65	2.84	3.11
130	1.59	1.98	2.31	2.98	3.10	3.06	2.83	2.34	2.08	2.09	2.21	2.39	2.23	2.76	2.87	3.09	2.64	2.87	3.05
135	1.80	3.04	3.42	1.70	3.55	3.66	3.78	2.56	2.33	2.33	2.59	2.82	3.14	3.47	3.35	1.68	2.36	2.44	2.85
140	1.84	3.04	3.26	3.22	1.70	3.99	4.03	3.75	3.33	3.45	3.64	3.87	4.13	4.01	2.37	2.92	3.66	3.17	1.86
145	1.69	3.09	3.36	3.57	2.90	1.69	4.11	4.66	4.21	4.27	4.23	4.42	4.66	2.06	1.94	3.63	3.69	3.54	1.73
150	1.95	2.80	3.12	3.59	3.70	3.48	1.93	1.83	2.58	3.30	2.94	2.05	1.70	2.36	3.64	3.79	3.61	3.39	1.90
155	1.97	2.78	3.15	3.69	3.69	2.95	3.64	3.74	2.56	1.99	2.04	3.31	3.68	3.76	3.28	2.94	3.13	2.98	1.99
160	1.76	2.40	2.82	2.78	2.89	3.47	3.80	4.08	3.83	3.51	3.35	3.72	3.67	3.81	3.55	3.02	2.49	2.24	1.80
165	1.73	1.94	2.29	2.83	3.41	3.47	3.77	3.74	3.70	3.43	3.17	3.35	3.41	3.29	2.76	2.46	2.29	2.22	1.86
170	2.00	2.14	2.44	2.83	2.89	3.11	3.15	3.30	3.42	3.13	3.10	3.20	2.48	2.50	2.44	2.43	2.51	2.42	2.06
175	2.27	2.34	2.44	2.64	2.84	2.80	2.73	2.71	2.66	2.63	2.46	2.10	2.15	2.72	2.89	2.94	2.73	2.51	2.26
180	2.29	2.32	2.35	2.33	2.33	2.36	2.29	2.24	2.08	1.83	2.23	2.19	2.12	2.24	2.21	2.25	2.22	2.24	2.27

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		2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279	2279		
5		2266	2254	2259	2264	2268	2259	2264	2262	2267	2259	2267	2259	2275	2270	2270	2276	2270		
10		2221	2219	2221	2222	2222	2223	2228	2224	2230	2234	2239	2238	2245	2239	2246	2252	2250		
15		2164	2157	2156	2162	2163	2165	2171	2174	2178	2179	2182	2180	2192	2195	2196	2200	2199		
20		2076	2070	2077	2084	2090	2087	2098	2101	2111	2109	2121	2118	2126	2121	2125	2134	2133		
25		1971	1965	1968	1972	1983	1992	2004	2009	2021	2026	2025	2023	2033	2030	2033	2035	2038		
30		1827	1822	1829	1849	1861	1879	1900	1913	1924	1927	1932	1924	1925	1917	1913	1915	1916		
35		1654	1642	1661	1676	1710	1736	1772	1794	1813	1813	1810	1791	1786	1766	1758	1757	1758		
40		1432	1431	1440	1466	1495	1528	1560	1581	1605	1620	1627	1611	1592	1573	1564	1558	1560		
45		1166	1169	1181	1180	1190	1198	1204	1204	1226	1251	1287	1309	1322	1319	1314	1313	1311		
50		871	883	876	865	861	847	813	778	784	808	866	937	974	996	1019	1035	1026		
55		596	624	627	618	610	574	527	484	469	499	559	617	672	694	724	739	726		
60		396	441	468	453	431	403	367	325	304	326	385	436	476	496	512	509	475		
65		267	326	351	314	306	307	278	233	208	221	276	329	348	355	377	366	316		
70		186	245	252	222	221	236	216	178	152	163	204	243	256	246	268	275	210		
75		146	188	177	157	147	170	162	139	123	129	152	179	172	168	187	204	153		
80		110	128	114	93.5	90.1	106	107	101	92.1	96.6	107	121	109	101	129	147	118		
85		55.4	59.5	51.4	41.7	38.4	40.7	43.9	42.4	40.5	43.8	52.5	56.1	55.7	55.5	71.6	74.2	71.6		
90		1.95	4.19	0.85	3.08	1.81	0.53	0.34	0.26	0.26	0.27	0.27	0.34	0.57	0.76	0.92	1.18	1.64		
95		1.32	1.35	1.96	1.80	0.99	0.79	0.58	0.55	0.56	0.51	0.48	0.53	0.64	0.70	0.91	1.17	1.21		
100		1.73	1.63	0.99	1.96	2.40	2.37	2.20	2.08	2.05	2.12	1.96	1.70	1.84	1.90	1.74	0.81	0.78		
105		1.92	2.36	1.18	1.54	1.41	1.80	1.99	2.29	2.38	2.39	2.41	2.18	1.77	1.22	1.22	1.12	1.10		
110		2.41	2.14	1.31	1.85	1.47	1.34	1.26	1.24	1.28	1.36	1.37	1.37	1.39	1.51	1.54	1.29	1.59		
115		2.38	2.54	1.46	2.21	1.69	1.58	1.44	1.45	1.45	1.48	1.50	1.62	1.63	1.79	1.78	1.57	2.16		
120		2.68	2.48	1.59	2.39	2.05	1.79	1.66	1.66	1.70	1.69	1.82	1.80	2.01	2.18	1.99	1.81	2.31		
125		2.98	2.88	1.83	2.54	2.44	2.19	1.99	1.90	1.90	1.91	2.04	2.34	2.29	2.49	2.44	1.86	2.53		
130		2.99	3.04	1.69	3.22	2.96	2.54	2.53	2.40	2.39	2.35	2.38	2.59	2.95	3.22	2.80	3.08	2.05		
135		3.11	2.55	1.73	3.53	3.63	3.41	2.99	2.67	2.74	2.82	2.90	3.17	3.92	3.71	1.77	3.77	3.39		
140		3.10	3.50	4.14	1.88	4.14	4.34	4.18	3.64	3.54	3.45	3.56	3.85	4.03	1.92	3.90	3.61	3.03		
145		3.20	3.71	4.24	4.87	1.91	3.25	4.66	4.63	4.05	3.96	4.02	3.25	1.87	4.17	3.76	3.49	3.10		
150		3.24	3.76	4.13	4.34	3.98	2.31	2.05	2.55	2.59	2.43	1.97	2.10	3.93	4.17	3.83	3.29	3.01		
155		2.85	3.07	3.15	3.57	4.64	4.80	5.46	4.78	3.81	4.41	5.20	4.76	2.99	3.57	3.88	3.37	2.94		
160		1.96	2.37	2.80	3.45	4.05	4.34	4.50	4.44	4.16	4.66	4.82	4.42	4.30	3.10	2.99	2.81	2.46		
165		1.85	2.22	2.24	2.43	2.84	3.76	3.99	3.73	3.60	3.72	3.92	4.02	3.83	3.54	3.00	2.66	2.13		
170		2.07	2.15	2.47	2.53	2.43	2.40	2.50	3.21	3.12	3.08	3.29	3.14	2.94	2.89	2.71	2.67	2.06		
175		2.26	2.28	2.33	2.56	2.77	2.83	2.50	2.16	2.25	2.63	2.62	2.60	2.60	2.57	2.50	2.27	2.19		
180		2.28	2.31	2.33	2.34	2.34	2.35	2.30	2.31	2.14	2.14	2.12	2.24	2.26	2.30	2.28	2.27	2.27		

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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