

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-L4

ULB4-40L-U-35-L4-MWS

40LB/4F/835/U/A4

40LB/4F/835/U/A4/MWS

Laboratory: Leading Testing Laboratories

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Report No.: HZ25030014u

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-L4**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
129.7	5031.0	38.80	0.9960
CCT (K)	CRI	Stabilization Time (Light & Power)	
3482	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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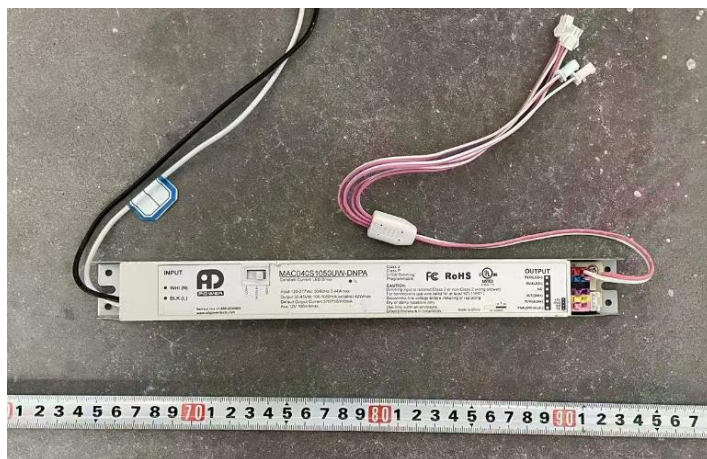
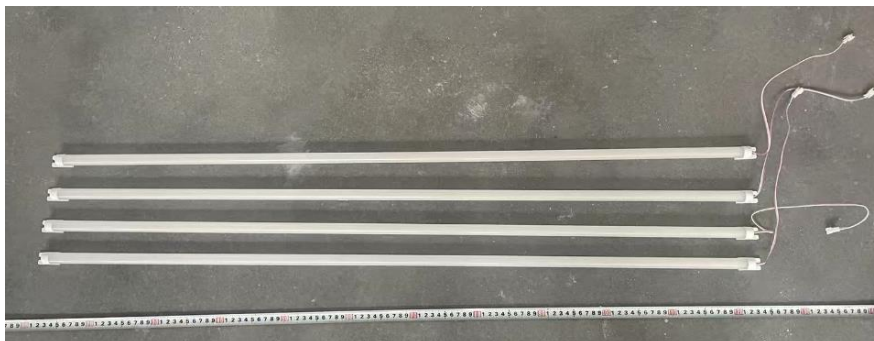


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x4

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB4-40L-U-35-L4	ULB4-40L-U-35-L4-MWS
	40LB/4F/835/U/A4	40LB/4F/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)	0.325	0.145
Power Factor	0.9960	0.9610
Test Power (W)	38.80	38.55
THD A%	7.18	15.20
Luminous Efficacy (lm/W)	129.7	131.1
Total Luminous Flux (lm)	5031.0	5053.8
Color Rendering Index (CRI)	82.9	
R9	10.3	
Correlated Color Temperature (CCT)(K)	3482	
Chromaticity Chroma x	0.4047	
Chromaticity Chroma y	0.3873	
Chromaticity Chroma u	0.2367	
Chromaticity Chroma v	0.3398	
Duv	-0.0014	
Chromaticity Chroma u'	0.2367	
Chromaticity Chroma v'	0.5097	

Special Color Rendering Indices	
R1	81.6
R2	89.3
R3	95.1
R4	82.1
R5	81.6
R6	85.6
R7	84.8
R8	63.3
R9	10.3
R10	74.9
R11	81.5
R12	64.5
R13	83.4
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)	0.325
Power Factor	0.9959
Power (W)	38.82
Luminous Efficacy (lm/W)	130.0
Total Luminous Flux (lm)	5047.5
Beam Angle (°)	93.6 (0°-180°) / 93.3 (90°-270°)
Center Beam Candle Power (cd)	2304
Maximum Beam Candle Power (cd)	2308 (At: C=80.0, Gamma=0.5)
Spacing Criteria	1.22 (0°-180°) / 1.24 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	88.45%
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	0.16%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

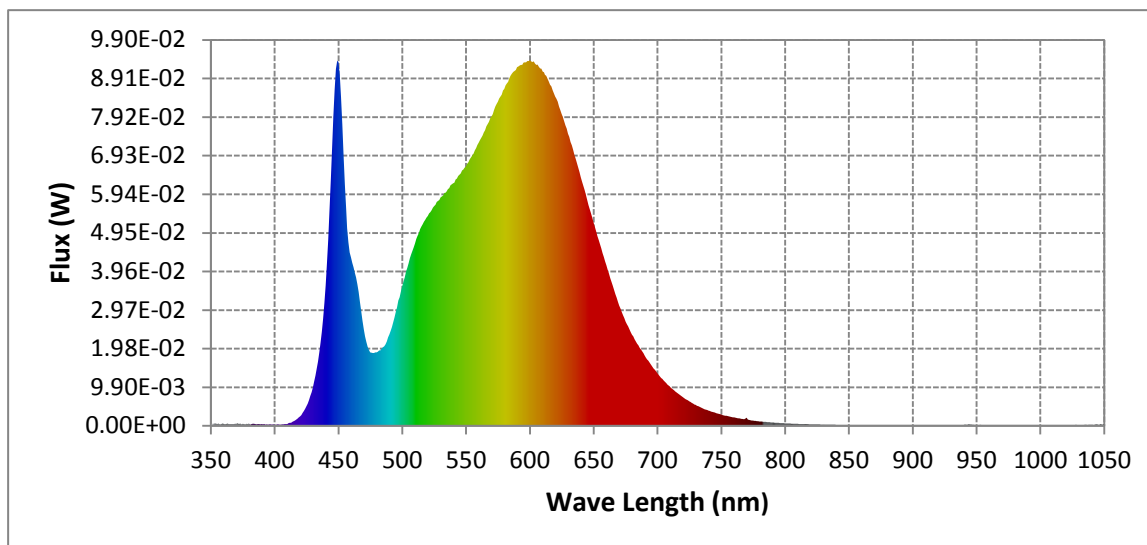
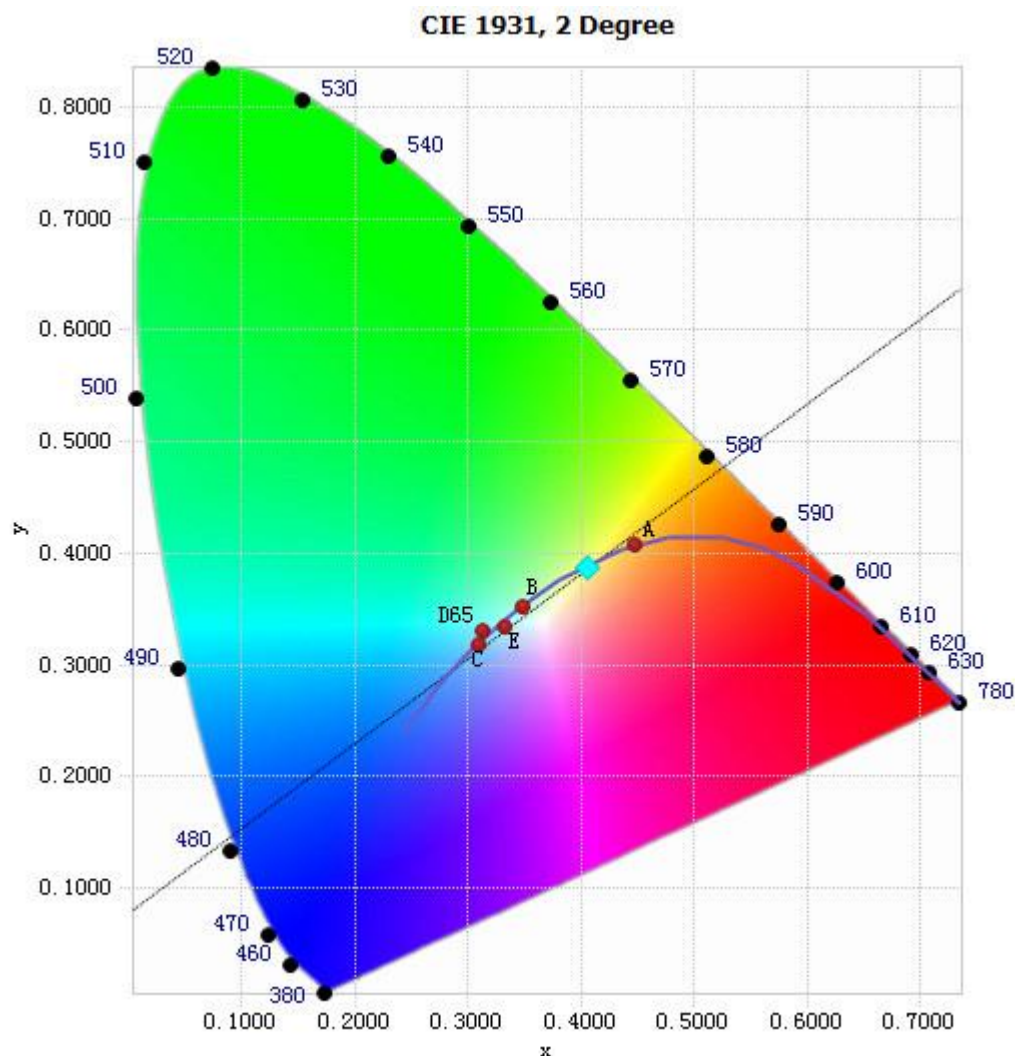


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	6.26E-04	485	2.01E-02	590	9.20E-02	695	1.57E-02
385	4.15E-04	490	2.34E-02	595	9.31E-02	700	1.35E-02
390	4.10E-04	495	2.91E-02	600	9.37E-02	705	1.16E-02
395	3.25E-04	500	3.57E-02	605	9.26E-02	710	9.98E-03
400	2.48E-04	505	4.16E-02	610	9.09E-02	715	8.57E-03
405	2.79E-04	510	4.67E-02	615	8.83E-02	720	7.33E-03
410	4.45E-04	515	5.11E-02	620	8.44E-02	725	6.26E-03
415	1.20E-03	520	5.38E-02	625	8.00E-02	730	5.39E-03
420	2.41E-03	525	5.64E-02	630	7.49E-02	735	4.56E-03
425	5.07E-03	530	5.86E-02	635	6.95E-02	740	3.92E-03
430	9.83E-03	535	6.01E-02	640	6.38E-02	745	3.37E-03
435	1.87E-02	540	6.22E-02	645	5.80E-02	750	2.88E-03
440	3.60E-02	545	6.44E-02	650	5.21E-02	755	2.48E-03
445	7.10E-02	550	6.65E-02	655	4.66E-02	760	2.17E-03
450	9.33E-02	555	6.93E-02	660	4.11E-02	765	1.84E-03
455	6.19E-02	560	7.26E-02	665	3.59E-02	770	2.10E-03
460	4.32E-02	565	7.58E-02	670	3.09E-02	775	1.36E-03
465	3.63E-02	570	7.93E-02	675	2.67E-02	780	1.15E-03
470	2.49E-02	575	8.31E-02	680	2.34E-02		
475	1.88E-02	580	8.64E-02	685	2.06E-02		
480	1.89E-02	585	8.98E-02	690	1.81E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4047, 0.3873)

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

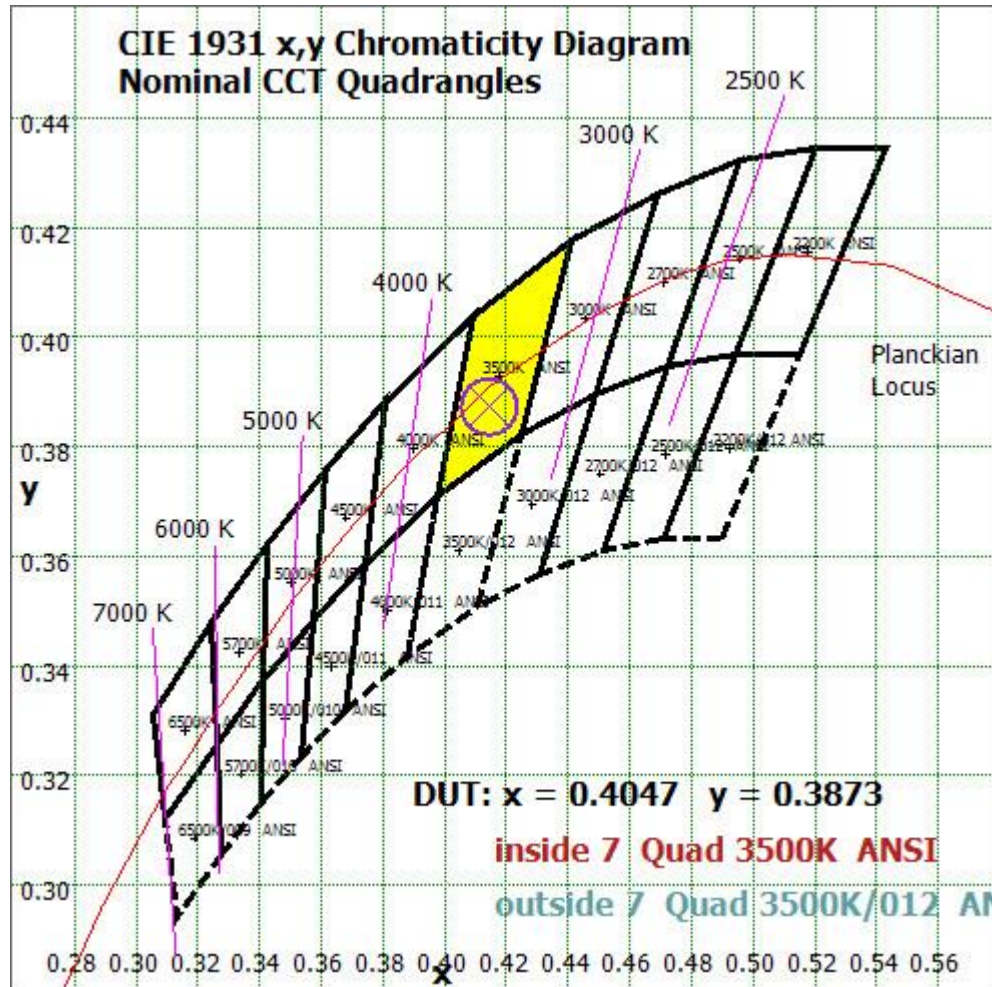


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram



Quality Assured
Color Rendition Report – Sphere Spectroradiometer Method

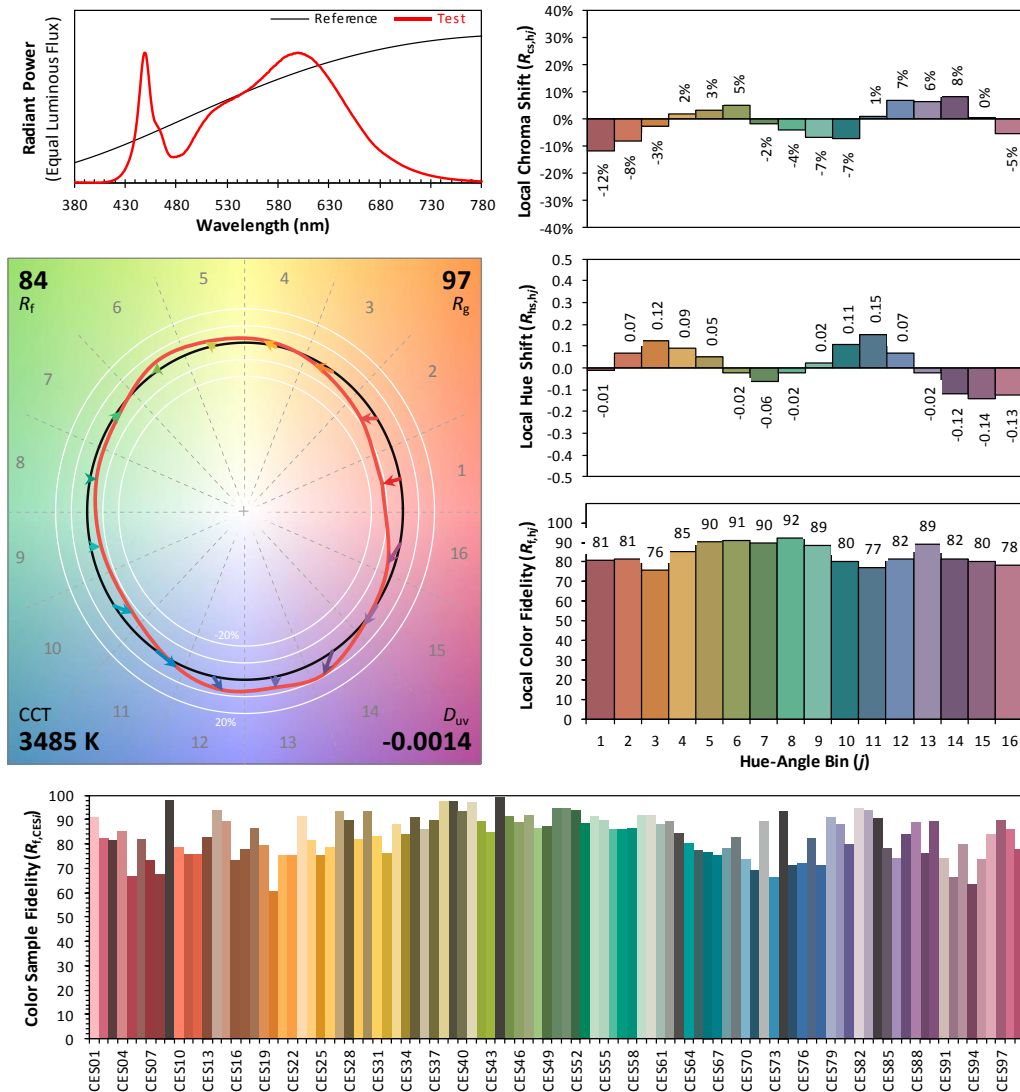
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/26

Model: ULB4-40L-U-35-L4



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

x 0.4047
 y 0.3873
 u' 0.2367
 v' 0.5097

CIE 13.3-1995
(CRI)

R_a 83
 R_g 11

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	217.773	4.31%
10- 20	623.34	12.35%
20- 30	940.63	18.64%
30- 40	1105.743	21.91%
40- 50	981.24	19.44%
50- 60	595.963	11.81%
60- 70	323.525	6.41%
70- 80	182.767	3.62%
80- 90	64.051	1.27%
90-100	1.089	0.02%
100-110	1.65	0.03%
110-120	1.59	0.03%
120-130	1.917	0.04%
130-140	2.138	0.04%
140-150	1.747	0.03%
150-160	1.302	0.03%
160-170	0.798	0.02%
170-180	0.24	0.00%
Total	5047.5	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	4464.689	88.45%
60- 90	570.343	11.30%
0-90	5035.032	99.75%
90- 180	12.471	0.25%
0- 180	5047.5	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

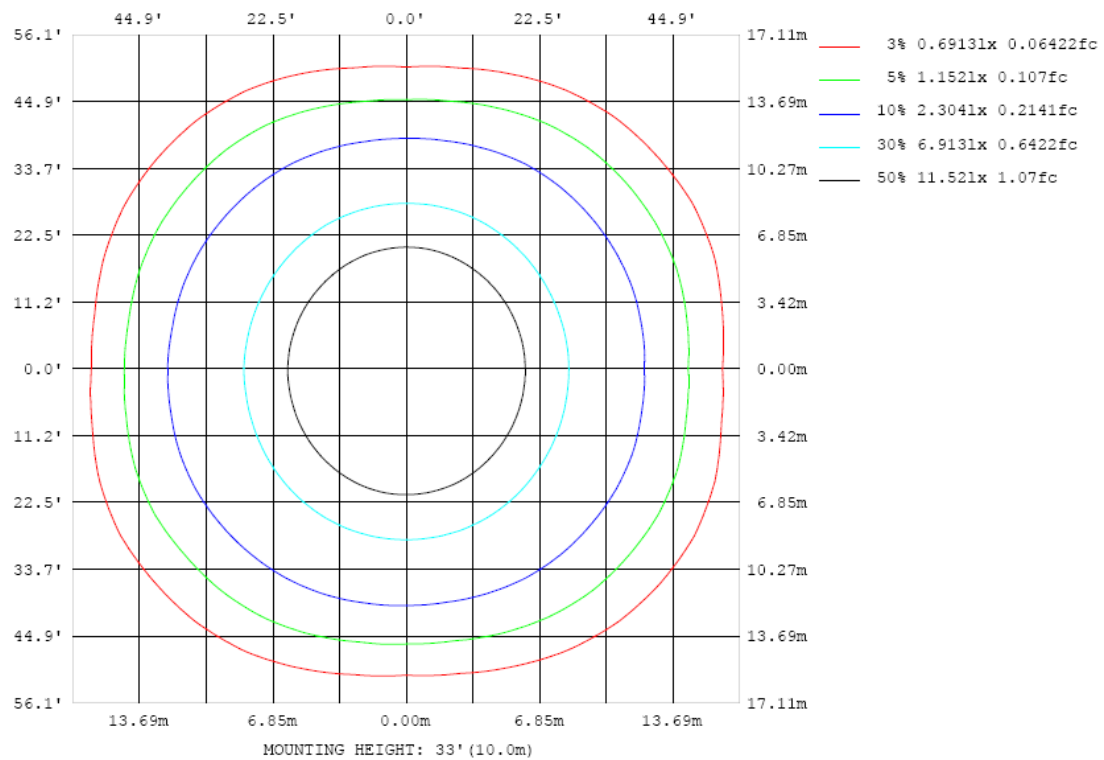


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

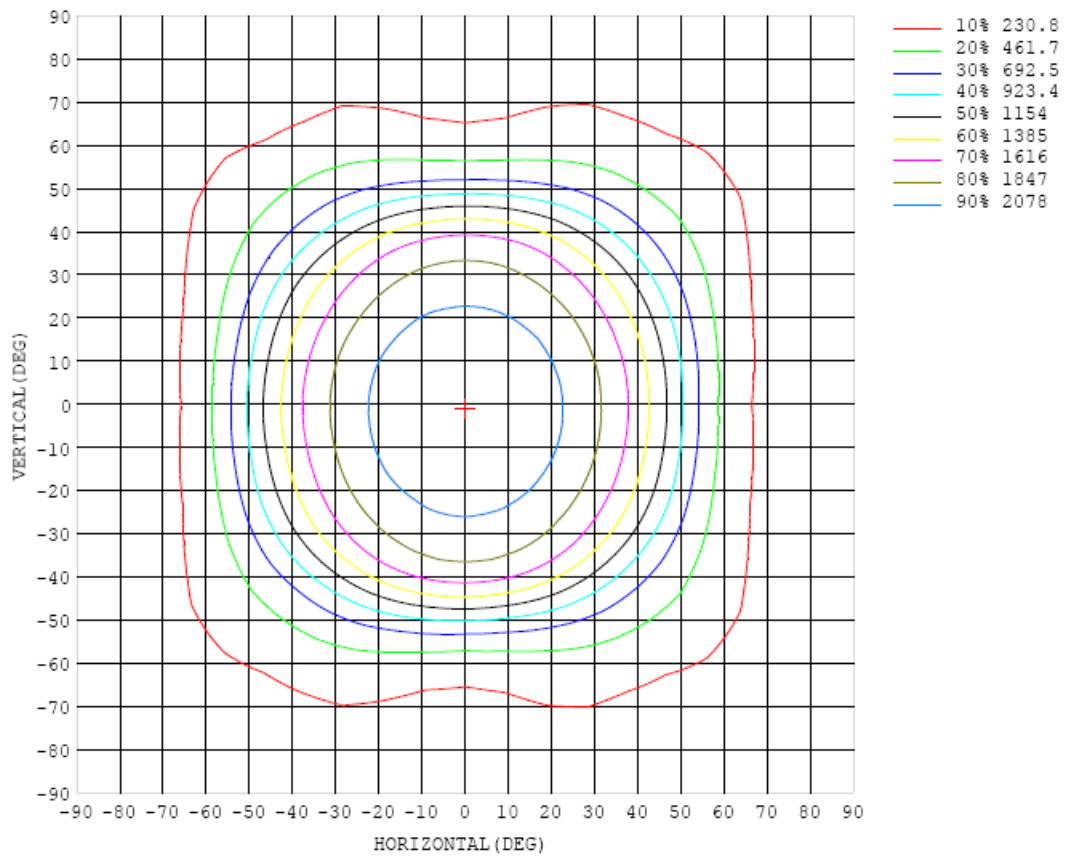


Chart 6: Isocandela Plot

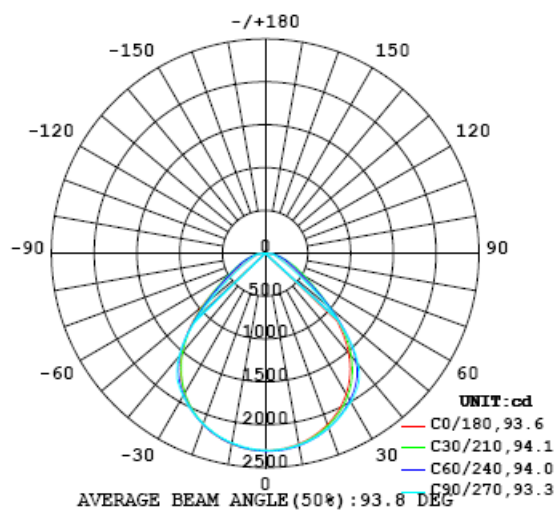


Chart 7: Polar Candela Distribution

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	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304
5	2286	2294	2289	2296	2299	2302	2308	2291	2311	2288	2297	2300	2301	2291	2291	2285	2296	2292	2286
10	2260	2259	2265	2265	2271	2274	2275	2277	2277	2275	2276	2275	2275	2266	2267	2260	2265	2260	2258
15	2201	2209	2211	2218	2222	2224	2235	2222	2244	2226	2231	2230	2228	2223	2219	2214	2212	2206	2200
20	2127	2132	2133	2143	2153	2163	2167	2171	2173	2166	2173	2169	2166	2148	2143	2133	2136	2129	2125
25	2026	2032	2041	2048	2060	2068	2083	2079	2102	2093	2090	2086	2077	2064	2056	2037	2033	2025	2020
30	1895	1904	1911	1925	1944	1965	1981	1995	2006	1998	2003	1995	1979	1956	1935	1918	1906	1890	1886
35	1730	1735	1748	1767	1795	1820	1853	1865	1894	1893	1886	1870	1848	1813	1785	1758	1738	1724	1721
40	1515	1525	1541	1562	1592	1628	1660	1677	1694	1689	1688	1680	1658	1622	1589	1552	1534	1516	1515
45	1261	1268	1287	1309	1325	1337	1356	1353	1355	1355	1362	1370	1366	1343	1328	1308	1283	1261	1259
50	954	964	996	1001	998	999	996	965	942	930	952	981	1001	1004	1008	1010	999	966	958
55	645	669	710	724	716	710	683	635	585	570	594	647	690	708	709	723	710	670	647
60	410	439	496	526	522	505	471	423	380	355	382	434	477	500	507	512	485	430	397
65	264	293	361	398	369	356	347	310	263	239	257	312	356	363	365	376	351	284	249
70	178	201	270	289	256	259	269	241	199	169	185	228	267	265	255	272	262	191	169
75	142	153	206	204	183	176	199	182	152	131	141	168	196	178	172	192	198	141	127
80	105	119	148	137	114	112	133	129	116	104	109	120	133	115	106	129	141	108	97.4
85	57.4	65.7	75.2	70.6	58.5	58.5	65.3	68.6	65.6	60.3	61.7	67.9	68.0	63.0	59.1	70.7	70.5	63.2	54.9
90	3.42	6.91	7.10	6.04	3.84	5.86	4.05	3.76	3.61	3.38	3.33	3.99	4.38	4.74	4.48	4.91	4.52	3.49	0.72
95	0.64	1.06	1.24	0.67	1.00	0.68	0.55	0.40	0.36	0.35	0.38	0.38	0.44	0.54	0.59	0.75	0.80	0.74	0.61
100	1.15	1.19	1.45	0.98	1.69	1.66	1.95	1.74	1.55	1.41	1.43	1.47	1.52	1.38	1.33	1.31	0.75	0.77	0.85
105	1.29	1.36	1.62	0.94	1.48	1.92	2.20	2.14	1.98	1.87	1.87	1.83	1.86	1.96	1.63	1.04	0.86	1.15	1.17
110	1.42	1.68	1.64	1.00	1.52	1.35	1.42	1.56	1.75	1.83	1.92	1.88	1.65	1.33	1.34	1.31	1.09	1.30	1.28
115	1.49	2.09	1.95	1.31	1.71	1.53	1.40	1.25	1.31	1.35	1.38	1.36	1.49	1.51	1.64	1.64	1.36	1.59	1.51
120	1.56	2.28	1.86	1.47	2.07	1.84	1.69	1.54	1.52	1.54	1.53	1.68	1.74	1.96	2.00	2.04	1.62	2.47	1.84
125	1.97	2.46	2.09	1.86	2.50	2.31	2.17	2.00	1.93	1.83	1.82	1.96	2.35	2.24	2.35	2.66	1.29	2.36	1.98
130	2.08	2.56	2.68	1.82	2.90	2.68	2.48	2.41	2.38	2.41	2.32	2.50	2.66	2.60	3.09	2.96	1.82	2.10	1.38
135	2.17	2.94	2.76	1.50	3.17	3.35	3.10	2.85	2.76	2.89	2.92	2.79	2.90	3.37	3.11	1.57	3.05	2.80	1.71
140	1.84	2.77	3.30	3.30	1.73	3.49	3.50	3.54	3.16	3.29	3.14	3.20	3.26	3.05	1.80	2.17	3.29	2.93	1.69
145	1.63	2.64	2.74	2.78	2.07	1.79	3.12	3.22	3.33	3.09	3.16	2.97	2.88	1.78	1.75	3.48	3.16	2.84	1.57
150	1.72	2.42	3.00	3.28	3.66	2.82	1.68	1.81	2.18	2.49	2.20	1.76	1.59	1.67	3.15	3.44	3.31	2.95	1.88
155	1.85	2.62	3.02	3.25	3.70	3.75	3.68	2.84	1.93	1.70	1.79	2.18	2.91	2.53	2.16	2.89	2.87	2.62	1.94
160	1.73	2.29	2.90	3.18	3.39	3.68	3.82	3.63	3.59	2.96	3.26	3.29	3.24	3.04	2.64	1.96	1.90	1.99	1.80
165	1.80	2.08	2.38	3.00	3.14	3.23	3.44	3.38	3.35	3.00	3.01	3.16	3.03	2.75	2.47	2.21	2.15	2.18	1.74
170	2.05	2.22	2.49	2.95	3.09	2.97	3.10	3.07	3.10	2.78	2.79	2.85	2.68	2.41	2.41	2.42	2.43	2.23	1.92
175	2.25	2.31	2.51	2.72	2.93	2.93	2.69	2.77	2.81	2.73	2.68	2.51	2.44	2.47	2.55	2.54	2.47	2.38	2.15
180	2.22	2.24	2.27	2.26	2.26	2.27	2.07	2.10	1.99	2.06	2.00	1.98	2.11	2.15	2.13	2.12	2.18	2.22	2.21

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	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304	2304		
5	2285	2288	2287	2290	2289	2293	2281	2298	2275	2283	2289	2290	2281	2282	2285	2296	2291		
10	2258	2252	2256	2254	2250	2251	2248	2250	2247	2249	2250	2251	2247	2251	2247	2259	2260		
15	2200	2200	2193	2196	2198	2200	2197	2210	2193	2198	2202	2199	2196	2197	2199	2205	2203		
20	2118	2114	2117	2120	2119	2124	2117	2125	2117	2124	2126	2126	2118	2117	2117	2128	2129		
25	2020	2014	2015	2019	2022	2026	2029	2042	2033	2033	2032	2030	2022	2024	2018	2022	2024		
30	1880	1881	1879	1887	1895	1912	1910	1923	1917	1923	1923	1914	1902	1894	1894	1898	1897		
35	1715	1704	1712	1724	1741	1761	1781	1802	1796	1794	1784	1771	1746	1730	1718	1722	1726		
40	1502	1500	1502	1515	1529	1553	1557	1570	1565	1569	1570	1561	1538	1527	1511	1511	1516		
45	1244	1238	1242	1242	1241	1242	1234	1227	1218	1232	1250	1265	1263	1260	1258	1260	1260		
50	941	946	941	927	915	903	867	839	826	843	881	928	942	953	966	977	966		
55	643	665	669	661	654	630	584	539	515	541	591	643	676	690	699	700	675		
60	415	457	483	483	476	452	412	363	338	359	408	453	484	498	509	493	445		
65	274	331	355	345	344	342	304	255	232	253	301	341	350	356	378	359	301		
70	189	248	263	241	244	257	226	190	171	191	231	258	258	255	276	271	208		
75	142	190	189	164	165	184	168	150	139	150	175	194	177	180	201	206	161		
80	112	137	127	102	102	118	115	107	101	110	120	127	112	112	134	147	129		
85	64.3	67.6	62.3	50.9	49.0	50.8	50.2	45.3	43.3	48.2	54.3	55.0	52.6	51.7	65.8	75.5	71.0		
90	1.07	1.26	1.16	0.80	0.72	0.53	0.35	0.27	0.25	0.27	0.31	0.36	0.45	0.47	0.73	0.84	0.90		
95	0.70	0.79	1.10	0.97	0.86	0.78	0.65	0.53	0.47	0.50	0.52	0.58	0.58	0.67	0.78	0.85	0.88		
100	0.77	0.86	1.50	1.83	1.92	1.85	2.05	2.00	1.88	1.86	1.83	1.55	1.41	1.39	1.22	0.99	0.98		
105	1.17	1.14	1.27	1.33	1.88	2.40	2.48	2.38	2.25	2.17	2.13	1.94	1.55	1.27	1.10	1.19	1.21		
110	1.43	1.39	1.46	1.57	1.59	1.50	1.52	1.66	1.71	1.64	1.47	1.33	1.28	1.46	1.28	1.48	1.43		
115	1.78	1.76	1.86	1.75	1.80	1.73	1.54	1.52	1.47	1.42	1.39	1.46	1.45	1.58	1.55	1.96	1.91		
120	2.37	1.62	2.29	2.20	1.92	2.00	1.77	1.65	1.66	1.64	1.66	1.72	1.74	1.94	1.68	1.88	2.15		
125	2.33	1.69	2.57	2.73	2.37	2.29	2.17	2.00	2.01	2.04	2.02	2.15	2.13	2.32	2.01	1.83	2.31		
130	2.16	2.88	1.82	3.22	2.84	2.75	2.58	2.62	2.56	2.47	2.52	2.60	2.63	2.88	1.85	2.53	2.37		
135	2.73	3.09	1.68	3.01	3.53	3.24	3.05	2.98	3.14	3.03	3.17	3.21	3.42	3.01	1.78	2.78	2.82		
140	2.90	3.19	3.26	1.70	3.31	3.44	3.38	3.47	3.47	3.56	3.70	3.60	3.14	1.80	3.17	3.32	2.77		
145	2.72	3.06	3.50	3.35	1.88	2.64	3.24	3.22	3.21	3.46	3.32	2.64	1.82	2.47	2.92	2.75	2.46		
150	2.86	3.15	3.38	3.46	2.75	1.99	1.95	2.48	2.53	2.43	1.92	2.00	3.25	3.50	3.28	3.01	2.30		
155	2.54	2.68	3.00	2.61	2.56	3.48	3.46	3.10	2.60	3.03	3.46	3.67	3.86	3.62	3.25	2.98	2.86		
160	1.79	1.94	2.10	2.40	3.13	3.39	3.65	3.83	3.61	3.87	3.97	3.79	3.61	3.44	3.37	3.00	2.30		
165	1.77	2.09	2.20	2.32	2.61	2.94	3.28	3.34	3.21	3.29	3.51	3.40	3.45	3.33	3.03	2.91	2.09		
170	1.93	2.00	2.36	2.48	2.43	2.48	2.65	2.82	2.90	2.85	3.05	3.05	3.07	2.88	2.95	2.68	2.07		
175	2.16	2.20	2.26	2.36	2.47	2.55	2.52	2.51	2.57	2.63	2.72	2.69	2.42	2.60	2.49	2.31	2.22		
180	2.20	2.24	2.26	2.25	2.25	2.26	2.21	2.22	2.09	2.13	2.08	2.13	2.16	2.19	2.16	2.17	2.18		

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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