



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-L3

ULB4-40L-U-35-L3-MWS

40LB/4F/835/U/A3

40LB/4F/835/U/A3/MWS

Laboratory: Leading Testing Laboratories

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Report No.: HZ25030014t

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-L3**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
129.1	5040.0	39.04	0.9963
CCT (K)	CRI	Stabilization Time (Light & Power)	
3485	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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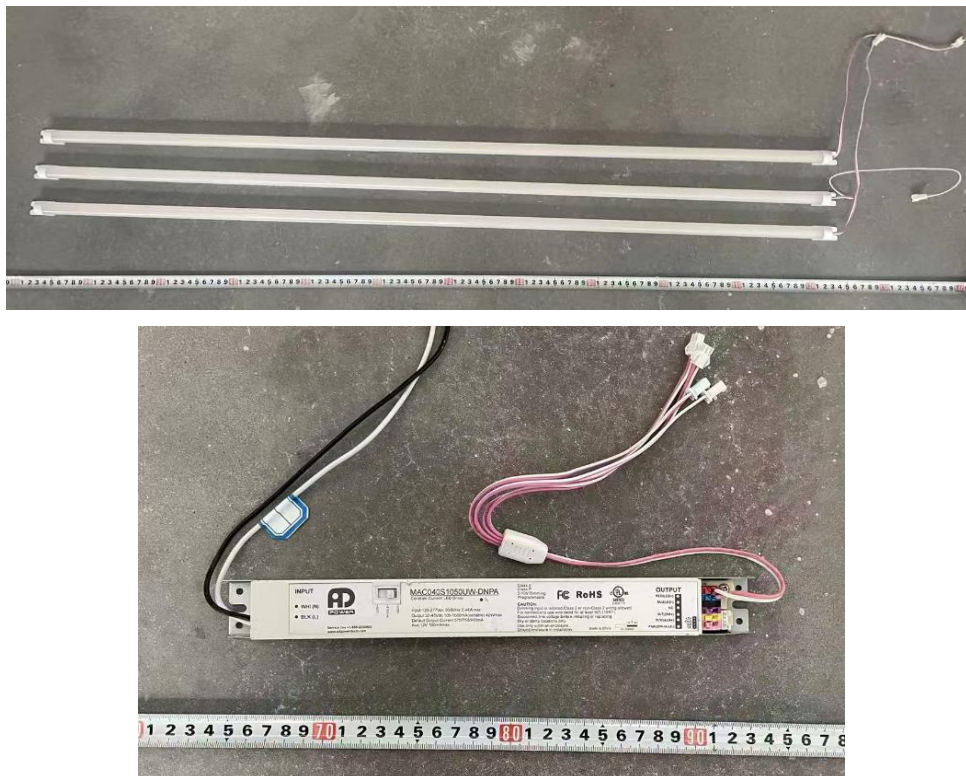


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x4

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB4-40L-U-35-L3	ULB4-40L-U-35-L3-MWS
	40LB/4F/835/U/A3	40LB/4F/835/U/A3/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)	0.327	0.146
Power Factor	0.9963	0.9614
Test Power (W)	39.04	38.81
THD A%	7.12	15.10
Luminous Efficacy (lm/W)	129.1	130.4
Total Luminous Flux (lm)	5040.0	5060.9
Color Rendering Index (CRI)	82.9	
R9	10.3	
Correlated Color Temperature (CCT)(K)	3485	
Chromaticity Chroma x	0.4045	
Chromaticity Chroma y	0.3870	
Chromaticity Chroma u	0.2367	
Chromaticity Chroma v	0.3397	
Duv	-0.0014	
Chromaticity Chroma u'	0.2367	
Chromaticity Chroma v'	0.5096	

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	10.3
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)	0.327
Power Factor	0.9960
Power (W)	39.10
Luminous Efficacy (lm/W)	129.2
Total Luminous Flux (lm)	5053.4
Beam Angle (°)	93.8 (0°-180°) / 92.9 (90°-270°)
Center Beam Candle Power (cd)	2308
Maximum Beam Candle Power (cd)	2313 (At: C=60.0, Gamma=0.5)
Spacing Criteria	1.22 (0°-180°) / 1.26 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	88.40%
Zonal Lumens in the 60 °-90 °Zone	11.32%
Zonal Lumens in the 90 °-120 °Zone	0.10%
Zonal Lumens in the 120 °-180 °Zone	0.17%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

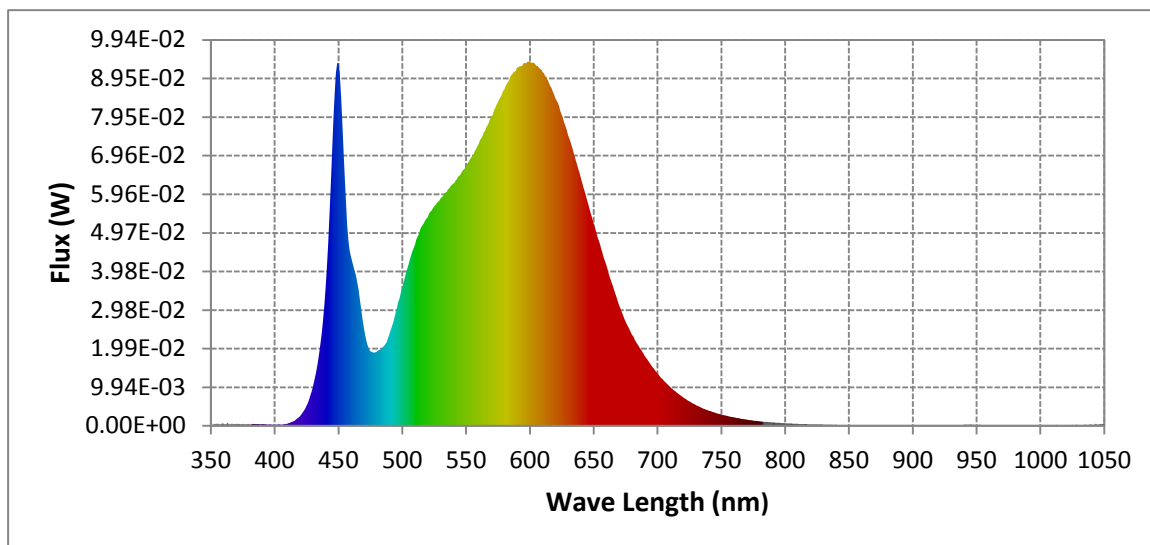
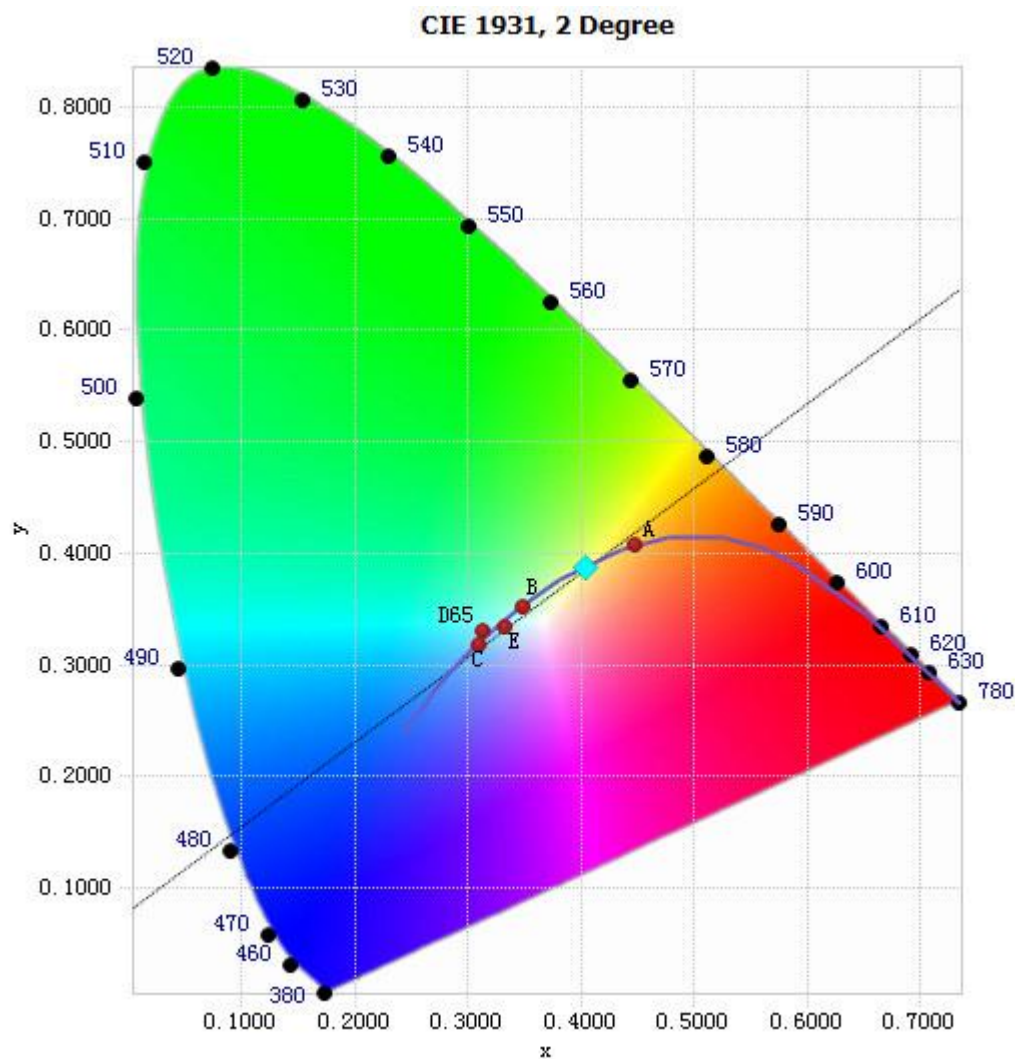


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	5.18E-04	485	2.03E-02	590	9.22E-02	695	1.57E-02
385	4.63E-04	490	2.36E-02	595	9.34E-02	700	1.36E-02
390	4.72E-04	495	2.93E-02	600	9.39E-02	705	1.16E-02
395	3.24E-04	500	3.56E-02	605	9.27E-02	710	1.00E-02
400	3.05E-04	505	4.16E-02	610	9.10E-02	715	8.64E-03
405	3.27E-04	510	4.66E-02	615	8.84E-02	720	7.39E-03
410	5.49E-04	515	5.12E-02	620	8.44E-02	725	6.33E-03
415	1.21E-03	520	5.37E-02	625	8.01E-02	730	5.39E-03
420	2.48E-03	525	5.65E-02	630	7.49E-02	735	4.61E-03
425	5.12E-03	530	5.86E-02	635	6.96E-02	740	3.93E-03
430	1.00E-02	535	6.02E-02	640	6.39E-02	745	3.40E-03
435	1.88E-02	540	6.24E-02	645	5.80E-02	750	2.91E-03
440	3.58E-02	545	6.44E-02	650	5.22E-02	755	2.50E-03
445	7.03E-02	550	6.66E-02	655	4.68E-02	760	2.16E-03
450	9.35E-02	555	6.96E-02	660	4.13E-02	765	1.85E-03
455	6.35E-02	560	7.26E-02	665	3.60E-02	770	1.60E-03
460	4.36E-02	565	7.60E-02	670	3.10E-02	775	1.37E-03
465	3.68E-02	570	7.95E-02	675	2.69E-02	780	1.19E-03
470	2.54E-02	575	8.33E-02	680	2.35E-02		
475	1.92E-02	580	8.66E-02	685	2.07E-02		
480	1.91E-02	585	9.01E-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): (0.4045, 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

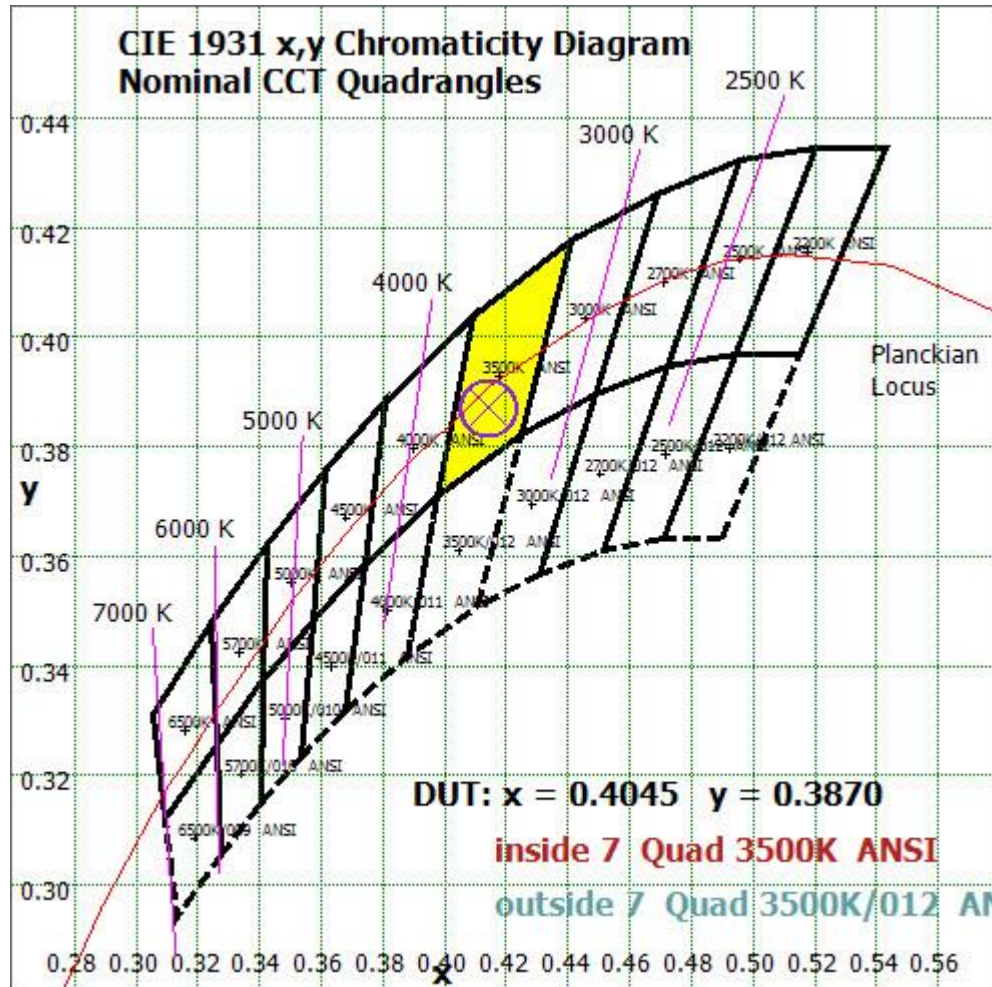


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram



Quality Assured
Color Rendition Report – Sphere Spectroradiometer Method

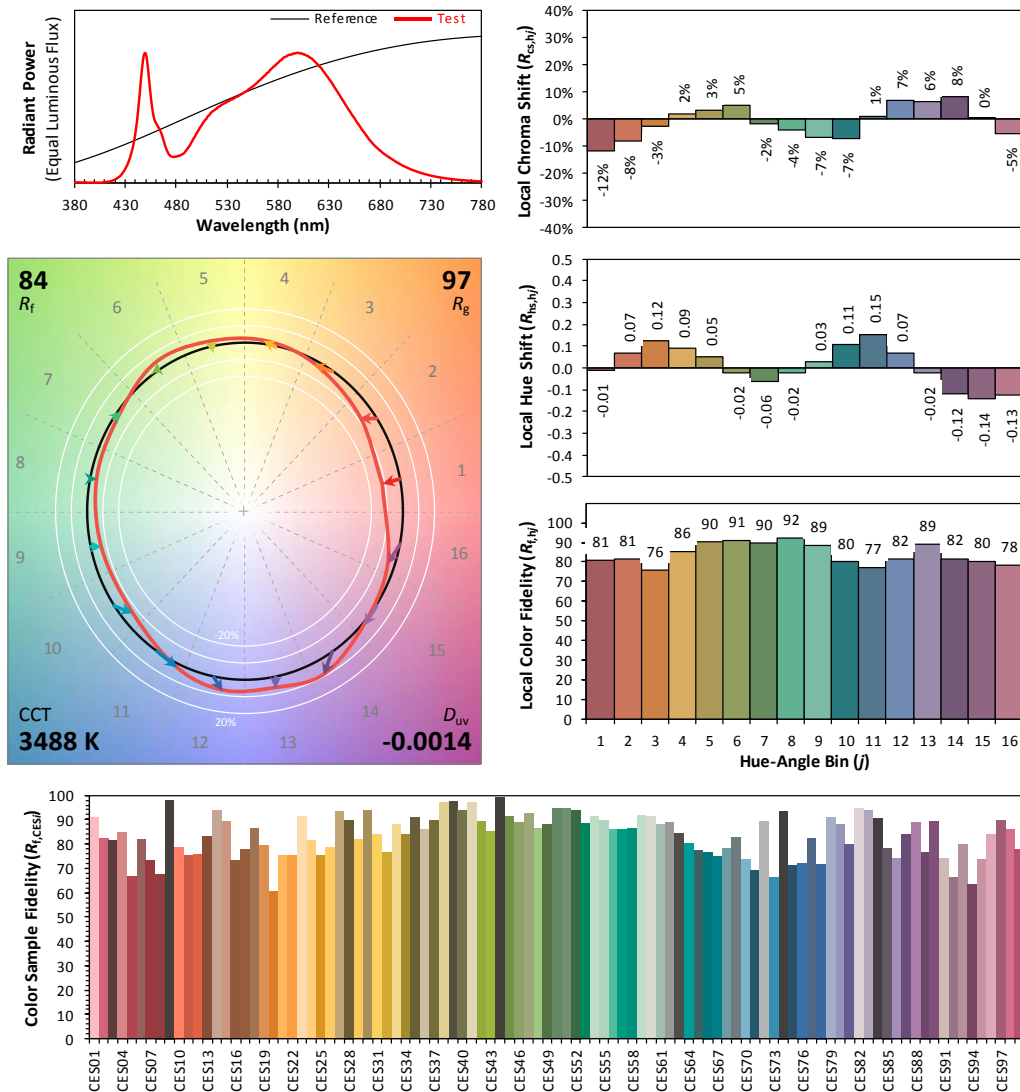
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/26

Model: ULB4-40L-U-35-L3



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

x 0.4045
 y 0.3870
 u' 0.2367
 v' 0.5096

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	218.34	4.32%
10- 20	624.669	12.36%
20- 30	943.145	18.66%
30- 40	1106.733	21.90%
40- 50	977.664	19.35%
50- 60	596.767	11.81%
60- 70	324.511	6.42%
70- 80	183.125	3.62%
80- 90	64.56	1.28%
90-100	1.167	0.02%
100-110	1.946	0.04%
110-120	1.932	0.04%
120-130	2.183	0.04%
130-140	2.293	0.05%
140-150	1.899	0.04%
150-160	1.328	0.03%
160-170	0.866	0.02%
170-180	0.271	0.01%
Total	5053.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	4467.318	88.40%
60- 90	572.196	11.32%
0-90	5039.514	99.73%
90- 180	13.885	0.27%
0- 180	5053.4	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

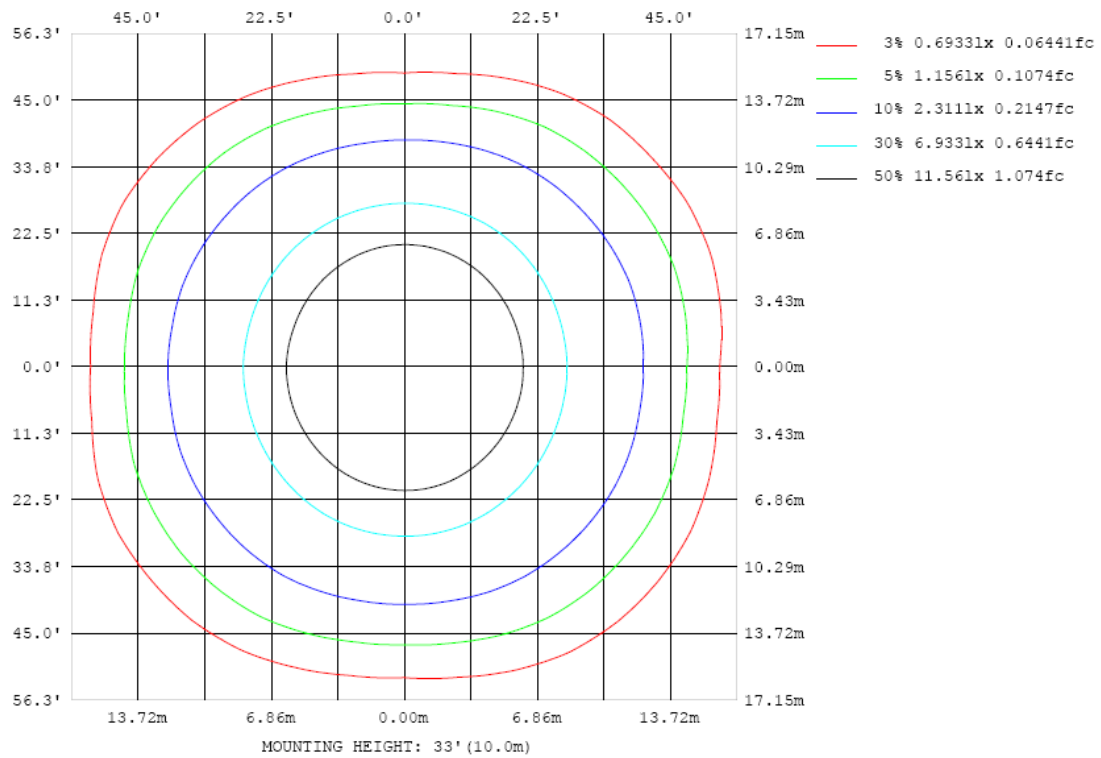


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

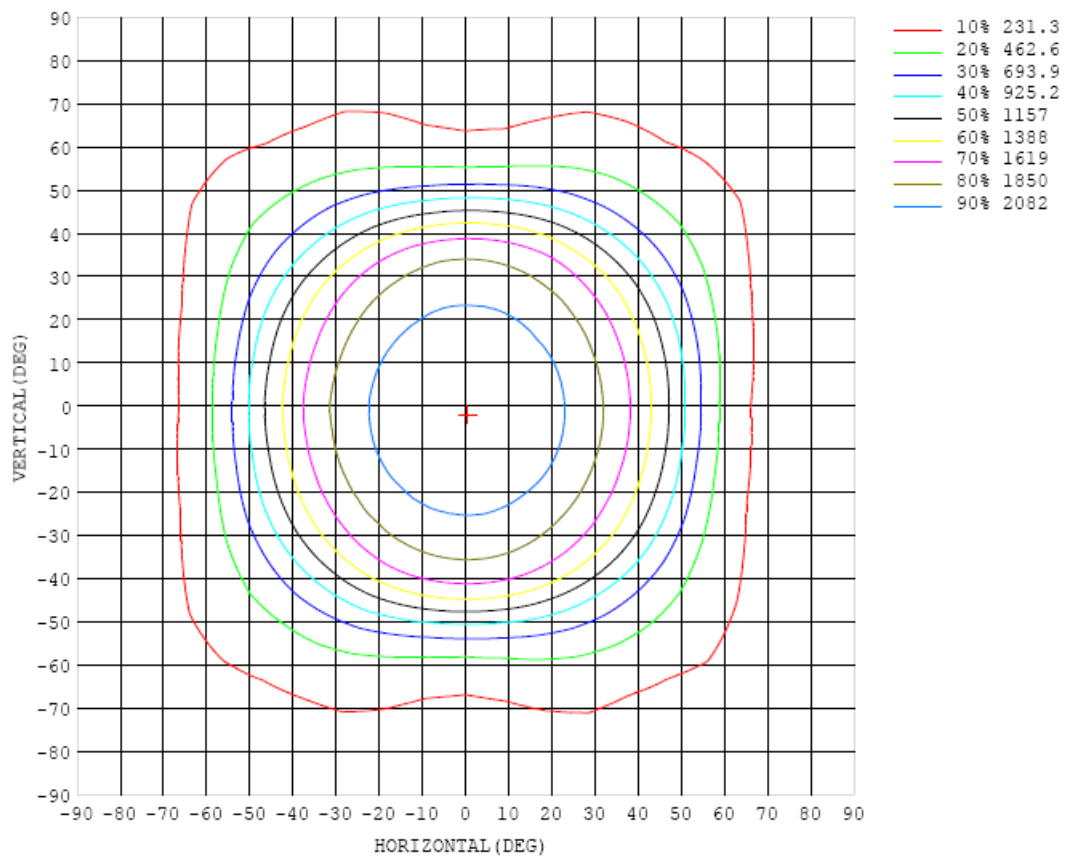


Chart 6: Isocandela Plot

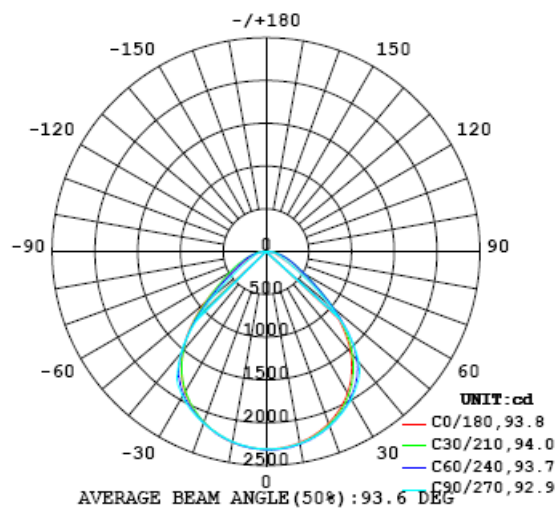


Chart 7: Polar Candela Distribution

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	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308
5	2297	2298	2303	2308	2297	2306	2313	2300	2308	2305	2306	2301	2298	2305	2309	2304	2300	2295	2291
10	2265	2270	2273	2276	2274	2283	2285	2271	2277	2279	2275	2280	2270	2271	2270	2275	2265	2263	2263
15	2214	2218	2222	2227	2222	2225	2235	2236	2235	2234	2231	2229	2226	2221	2221	2215	2211	2207	2207
20	2136	2143	2150	2156	2151	2166	2172	2163	2170	2170	2169	2164	2158	2158	2155	2143	2137	2131	2124
25	2034	2044	2050	2057	2059	2072	2081	2076	2085	2087	2083	2081	2064	2059	2049	2047	2032	2025	2028
30	1908	1915	1923	1932	1934	1953	1973	1983	1989	1992	1987	1978	1964	1947	1934	1914	1903	1894	1890
35	1742	1752	1756	1771	1788	1817	1840	1850	1869	1870	1864	1847	1821	1805	1779	1751	1733	1723	1721
40	1536	1542	1553	1569	1589	1624	1657	1668	1681	1684	1677	1666	1634	1601	1571	1547	1520	1509	1507
45	1284	1288	1300	1324	1341	1353	1372	1377	1372	1375	1371	1368	1360	1339	1316	1291	1269	1246	1243
50	982	986	1008	1024	1023	1029	1025	1006	979	966	975	996	1015	1019	1010	1000	979	948	944
55	670	674	715	733	731	737	725	688	644	620	636	677	716	731	743	725	710	659	639
60	409	428	482	518	530	532	514	472	422	393	411	453	495	522	524	524	495	433	406
65	255	276	340	383	383	383	381	346	293	265	281	328	365	375	377	391	360	293	261
70	169	187	251	285	268	272	288	255	214	189	207	248	278	276	268	286	273	205	177
75	127	139	191	209	183	184	208	189	165	148	159	189	208	192	191	206	207	159	143
80	97.3	109	143	142	119	118	137	134	123	114	122	134	143	125	119	139	147	128	105
85	55.4	65.5	77.4	75.9	64.0	63.6	70.3	72.5	67.0	64.2	67.8	72.4	71.8	64.3	58.5	69.8	75.6	68.2	57.9
90	3.29	6.64	3.12	3.06	3.37	2.95	6.93	6.00	4.69	4.38	4.39	6.09	5.83	5.73	4.32	4.60	4.28	3.76	0.78
95	0.59	0.77	0.86	0.97	0.95	0.72	0.63	0.50	0.40	0.36	0.36	0.41	0.47	0.55	0.58	0.67	0.83	0.91	0.77
100	0.77	0.71	0.82	1.54	1.70	1.54	1.31	1.18	1.16	1.12	1.07	0.96	1.02	1.14	1.40	1.46	1.39	1.06	1.35
105	1.10	1.19	1.00	1.29	2.22	2.32	2.38	2.26	2.16	2.12	2.11	2.12	2.16	2.08	2.07	1.64	1.25	1.40	1.56
110	1.28	1.46	1.29	1.44	1.55	2.23	2.47	2.47	2.51	2.53	2.48	2.35	2.26	2.10	1.85	1.25	1.63	1.65	1.60
115	1.53	1.69	1.60	1.91	1.77	1.68	1.91	2.12	2.32	2.37	2.27	2.07	1.92	1.47	1.59	1.52	1.96	1.61	1.87
120	1.88	2.23	1.36	2.33	2.27	2.03	1.94	1.80	1.69	1.73	1.68	1.63	1.74	1.84	1.97	1.91	2.36	2.48	2.16
125	2.02	2.47	1.52	2.95	2.65	2.48	2.39	2.31	2.07	2.07	2.04	2.05	2.19	2.25	2.41	2.36	1.98	2.86	2.21
130	1.46	2.18	2.85	2.48	3.22	2.80	2.97	2.76	2.69	2.56	2.62	2.76	2.65	2.66	3.12	2.77	1.91	2.33	2.03
135	1.69	2.89	3.39	1.62	3.31	3.48	3.24	2.89	2.99	3.03	3.01	2.96	2.99	3.33	3.21	1.66	2.26	3.03	2.30
140	1.85	3.29	3.38	3.22	1.65	3.52	3.68	3.50	3.33	3.33	3.37	3.46	3.51	3.39	2.20	1.84	3.23	2.62	1.87
145	1.62	3.11	3.39	3.27	2.17	1.70	3.27	3.57	3.50	3.58	3.59	3.62	3.32	2.03	1.77	3.21	3.41	3.24	1.74
150	1.83	3.28	3.37	3.53	3.45	2.18	1.70	1.74	2.64	2.77	2.68	1.96	1.66	1.74	3.15	3.58	3.44	3.27	1.88
155	1.96	3.29	3.52	3.51	2.80	2.59	3.46	2.47	1.99	1.76	1.81	2.10	2.93	3.18	2.42	2.85	3.27	3.48	1.97
160	1.75	2.08	2.67	2.76	3.19	3.72	3.77	3.55	3.38	3.18	3.25	3.21	3.34	3.35	3.43	2.88	2.41	2.55	1.79
165	1.83	2.53	3.18	3.47	3.68	3.76	3.72	3.62	3.50	3.42	3.41	3.46	3.42	3.42	2.93	2.42	2.43	2.42	1.81
170	2.04	2.28	3.07	3.63	3.69	3.45	3.45	3.52	3.35	3.25	3.25	3.39	2.77	2.56	2.42	2.55	2.65	2.43	1.97
175	2.26	2.32	2.52	3.06	3.38	3.38	3.29	3.30	3.35	3.27	3.16	2.40	2.52	3.47	3.55	3.47	3.08	2.65	2.23
180	2.26	2.29	2.31	2.32	2.30	2.31	2.22	2.23	2.07	2.17	2.15	2.17	2.20	2.25	2.24	2.25	2.29	2.32	2.24

Table 6: Luminous Intensity Data

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308	2308		
5	2295	2295	2296	2285	2297	2304	2285	2290	2291	2291	2295	2289	2296	2298	2302	2297	2296		
10	2258	2257	2259	2253	2257	2260	2253	2258	2256	2257	2254	2255	2263	2269	2263	2266	2267		
15	2201	2200	2198	2194	2197	2199	2198	2200	2202	2204	2205	2204	2207	2202	2210	2209	2212		
20	2123	2119	2122	2111	2122	2134	2123	2133	2134	2133	2136	2125	2132	2136	2137	2133	2135		
25	2018	2017	2013	2019	2029	2039	2041	2053	2054	2053	2049	2046	2045	2040	2029	2030	2033		
30	1884	1879	1887	1888	1911	1926	1936	1941	1952	1951	1949	1937	1929	1916	1911	1901	1903		
35	1710	1707	1717	1730	1750	1783	1790	1806	1813	1814	1805	1786	1775	1765	1752	1740	1738		
40	1494	1493	1500	1504	1520	1530	1530	1537	1545	1549	1557	1562	1562	1552	1540	1530	1532		
45	1230	1233	1231	1212	1207	1206	1187	1167	1174	1190	1218	1243	1250	1270	1286	1283	1283		
50	931	937	920	898	885	865	821	791	787	810	850	889	922	947	977	996	992		
55	643	667	665	645	632	595	540	491	471	496	551	610	646	671	694	708	695		
60	426	472	492	474	450	417	374	328	306	326	381	430	464	480	500	492	456		
65	286	347	372	330	319	316	281	235	210	223	275	324	341	348	367	359	304		
70	198	260	267	234	232	244	219	180	154	165	203	242	250	241	262	269	205		
75	152	199	189	164	155	177	165	141	124	131	152	177	169	163	184	201	152		
80	117	139	124	98.7	95.9	111	110	102	91.7	95.7	106	118	107	97.7	124	142	117		
85	62.4	67.7	58.1	46.4	42.4	45.7	48.7	45.8	43.3	44.6	51.8	54.3	53.6	53.3	66.2	69.9	68.3		
90	1.85	4.09	0.76	1.89	1.40	0.68	0.37	0.29	0.29	0.31	0.32	0.42	0.54	0.80	1.04	1.23	1.00		
95	1.19	1.71	0.79	1.25	1.33	0.99	0.76	0.67	0.60	0.56	0.58	0.63	0.66	0.70	0.83	0.85	0.94		
100	1.60	1.83	1.60	2.03	2.06	1.86	1.69	1.64	1.54	1.62	1.70	1.76	1.85	1.83	1.60	1.06	0.86		
105	1.77	1.92	1.06	2.16	2.55	2.55	2.50	2.49	2.43	2.45	2.46	2.42	2.45	2.04	1.24	1.05	1.33		
110	2.06	2.35	1.28	1.96	1.77	2.07	2.41	2.51	2.52	2.56	2.43	2.14	1.66	1.62	1.56	1.35	1.38		
115	2.58	3.17	1.64	2.28	2.08	1.89	1.69	1.68	1.74	1.73	1.71	1.86	1.89	1.91	1.98	1.64	1.47		
120	2.96	2.71	1.81	2.78	2.52	2.32	2.20	2.18	2.20	2.15	2.16	2.22	2.37	2.38	2.31	1.72	2.00		
125	3.08	2.68	2.00	3.14	2.90	2.93	2.80	2.77	2.64	2.65	2.70	3.00	2.74	2.70	2.93	1.35	2.22		
130	2.63	2.86	1.69	3.62	3.26	3.28	3.27	3.31	3.33	3.28	3.34	3.13	3.03	3.31	2.52	2.44	2.19		
135	3.28	2.50	1.74	3.41	3.90	3.72	3.46	3.49	3.59	3.58	3.53	3.53	3.63	3.16	1.55	2.74	2.86		
140	2.71	3.47	3.32	1.88	3.83	3.91	4.05	3.89	3.99	3.88	4.00	3.79	3.53	1.84	2.27	2.94	2.91		
145	3.08	3.60	3.66	3.40	1.99	3.20	3.99	4.08	4.10	4.04	3.70	3.03	1.95	2.51	2.83	2.86	2.84		
150	3.41	3.61	3.71	3.57	3.20	2.17	2.12	2.15	2.40	2.08	2.01	2.01	2.52	3.16	3.19	3.12	3.05		
155	3.05	3.36	3.46	3.03	3.25	3.40	3.44	2.78	2.49	2.66	3.40	3.37	3.05	2.86	3.06	3.26	3.05		
160	2.36	2.86	2.82	3.25	3.75	3.55	3.46	3.54	2.85	2.85	3.58	3.78	3.61	3.41	3.05	2.79	2.29		
165	1.83	2.67	2.69	2.69	3.12	3.62	3.40	3.51	3.26	3.16	3.36	3.52	3.80	3.52	3.41	3.36	2.62		
170	1.97	2.20	2.87	2.96	2.85	2.85	2.97	3.47	3.06	2.91	2.96	3.17	3.06	3.31	3.40	3.37	2.26		
175	2.23	2.25	2.44	3.02	3.30	3.56	2.94	2.64	2.49	2.90	2.88	2.89	2.79	2.71	2.64	2.32	2.21		
180	2.24	2.28	2.31	2.30	2.31	2.32	2.28	2.28	2.14	2.15	2.12	2.19	2.21	2.27	2.25	2.25	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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