

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-40-L4

ULB3-30L-U-40-L4-MWS

30LB/3F/840/U/A4

30LB/3F/840/U/A4/MWS

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ250300140

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

Engineer: Wei Fei
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: **ULB3-30L-U-40-L4**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
132.2	5126.8	38.79	0.9962
CCT (K)	CRI	Stabilization Time (Light & Power)	
4014	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. 21, 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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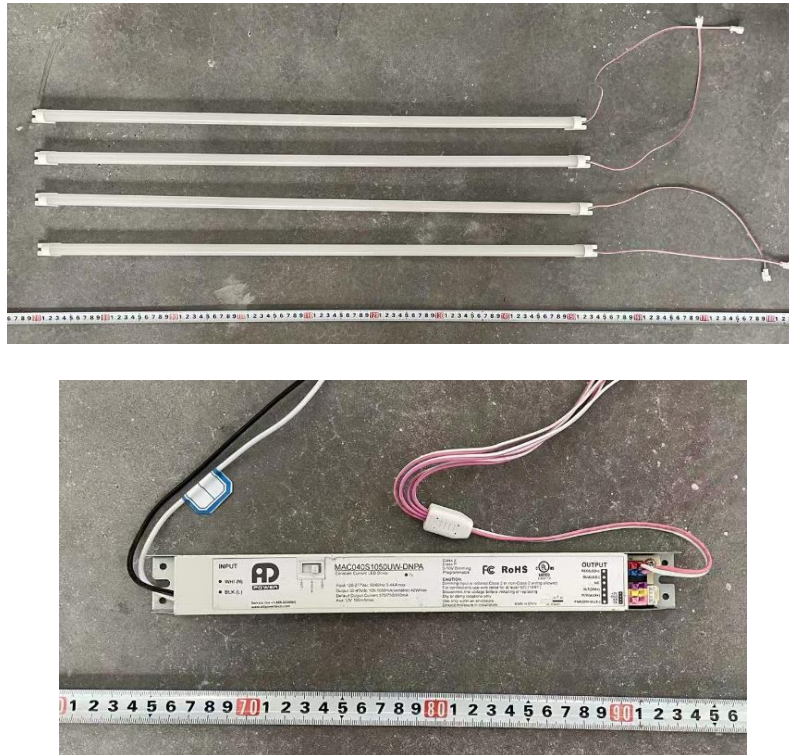


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x4

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB3-30L-U-40-L4	ULB3-30L-U-40-L4-MWS
	30LB/3F/840/U/A4	30LB/3F/840/U/A4/MWS
Electrical Ratings	: 120-277V, 50/60Hz	
Product Description	: Field-Adjustable 40W/36W/32W, 4000K 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	0.9962	0.9617
Test Power (W)	38.79	38.54
THD A%	7.25	15.03
Luminous Efficacy (lm/W)	132.2	133.5
Total Luminous Flux (lm)	5126.8	5147.0
Color Rendering Index (CRI)	82.9	
R9	9.2	
Correlated Color Temperature (CCT)(K)	4014	
Chromaticity Chroma x	0.3800	
Chromaticity Chroma y	0.3775	
Chromaticity Chroma u	0.2245	
Chromaticity Chroma v	0.3346	
Duv	0.0005	
Chromaticity Chroma u'	0.2245	
Chromaticity Chroma v'	0.5018	

Special Color Rendering Indices	
R1	81.3
R2	88.3
R3	93.8
R4	82.7
R5	81.4
R6	83.9
R7	86.4
R8	65.3
R9	9.2
R10	72.4
R11	82.1
R12	60.9
R13	82.9
R14	96.6

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)	38.81
Luminous Efficacy (lm/W)	132.4
Total Luminous Flux (lm)	5139.7
Beam Angle (°)	95.0 (0°-180°) / 94.0 (90°-270°)
Center Beam Candle Power (cd)	2331
Maximum Beam Candle Power (cd)	2336 (At: C=310.0, Gamma=1.5)
Spacing Criteria	1.20 (0°-180°) / 1.29 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	88.43%
Zonal Lumens in the 60 °-90 °Zone	11.37%
Zonal Lumens in the 90 °-120 °Zone	0.07%
Zonal Lumens in the 120 °-180 °Zone	0.13%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

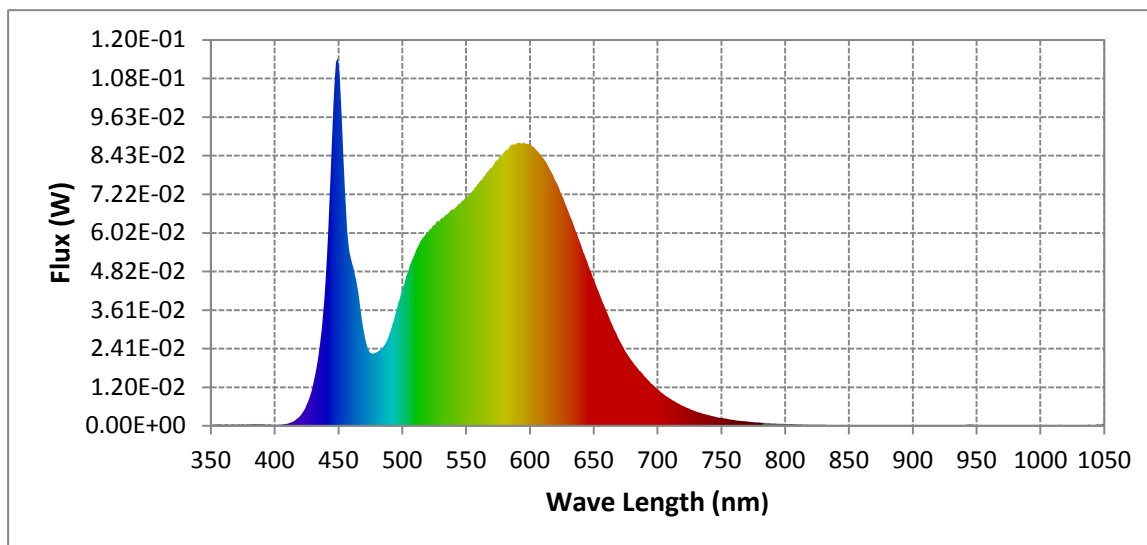
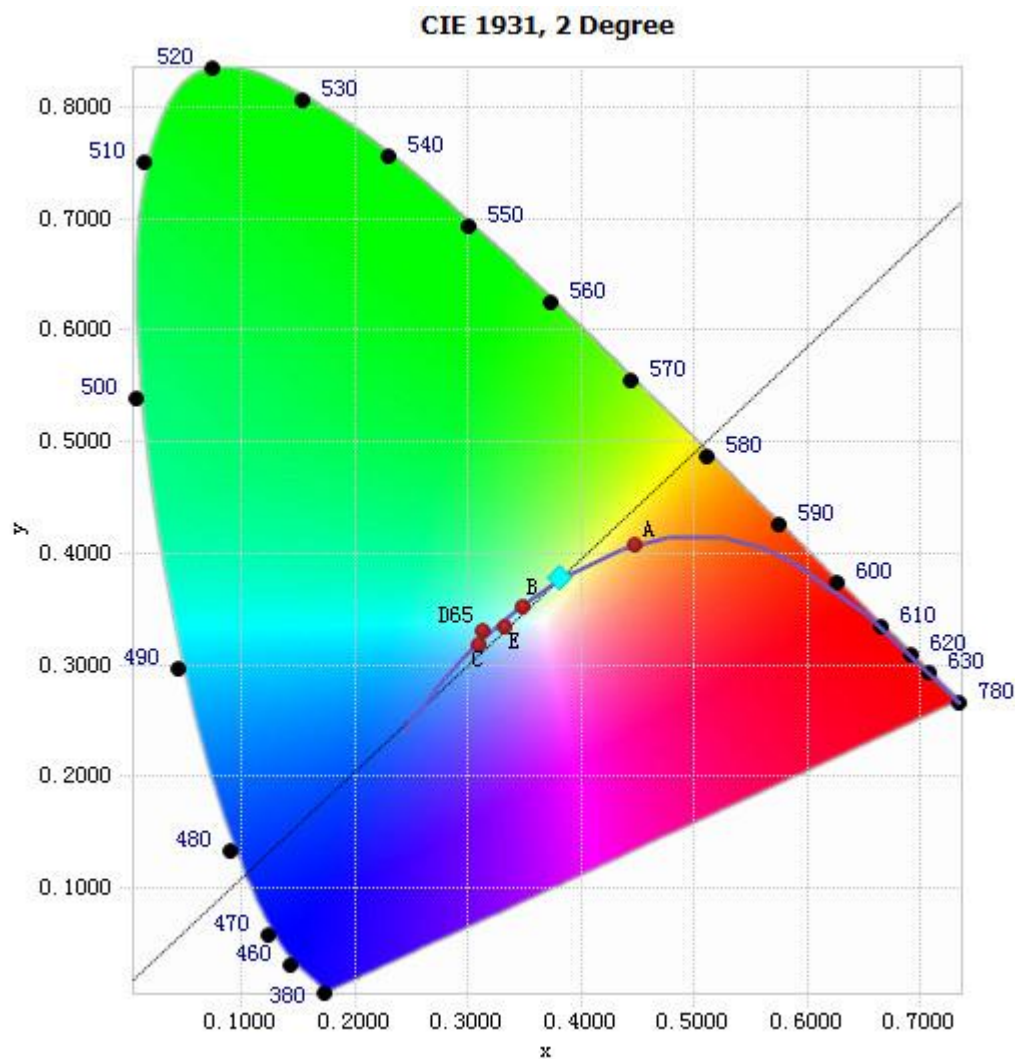


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	5.09E-04	485	2.45E-02	590	8.83E-02	695	1.33E-02
385	4.25E-04	490	2.85E-02	595	8.83E-02	700	1.15E-02
390	4.49E-04	495	3.53E-02	600	8.79E-02	705	9.84E-03
395	3.42E-04	500	4.24E-02	605	8.60E-02	710	8.43E-03
400	2.95E-04	505	4.85E-02	610	8.35E-02	715	7.23E-03
405	3.69E-04	510	5.37E-02	615	8.06E-02	720	6.21E-03
410	6.80E-04	515	5.80E-02	620	7.66E-02	725	5.33E-03
415	1.43E-03	520	6.03E-02	625	7.19E-02	730	4.53E-03
420	3.03E-03	525	6.26E-02	630	6.71E-02	735	3.87E-03
425	6.40E-03	530	6.45E-02	635	6.19E-02	740	3.30E-03
430	1.25E-02	535	6.58E-02	640	5.65E-02	745	2.85E-03
435	2.37E-02	540	6.75E-02	645	5.12E-02	750	2.44E-03
440	4.56E-02	545	6.92E-02	650	4.57E-02	755	2.13E-03
445	8.96E-02	550	7.10E-02	655	4.07E-02	760	1.80E-03
450	1.14E-01	555	7.32E-02	660	3.58E-02	765	1.56E-03
455	7.41E-02	560	7.57E-02	665	3.11E-02	770	1.36E-03
460	5.21E-02	565	7.80E-02	670	2.68E-02	775	1.15E-03
465	4.34E-02	570	8.05E-02	675	2.31E-02	780	1.02E-03
470	2.95E-02	575	8.30E-02	680	2.02E-02		
475	2.27E-02	580	8.53E-02	685	1.76E-02		
480	2.29E-02	585	8.75E-02	690	1.54E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3800, 0.3775)

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

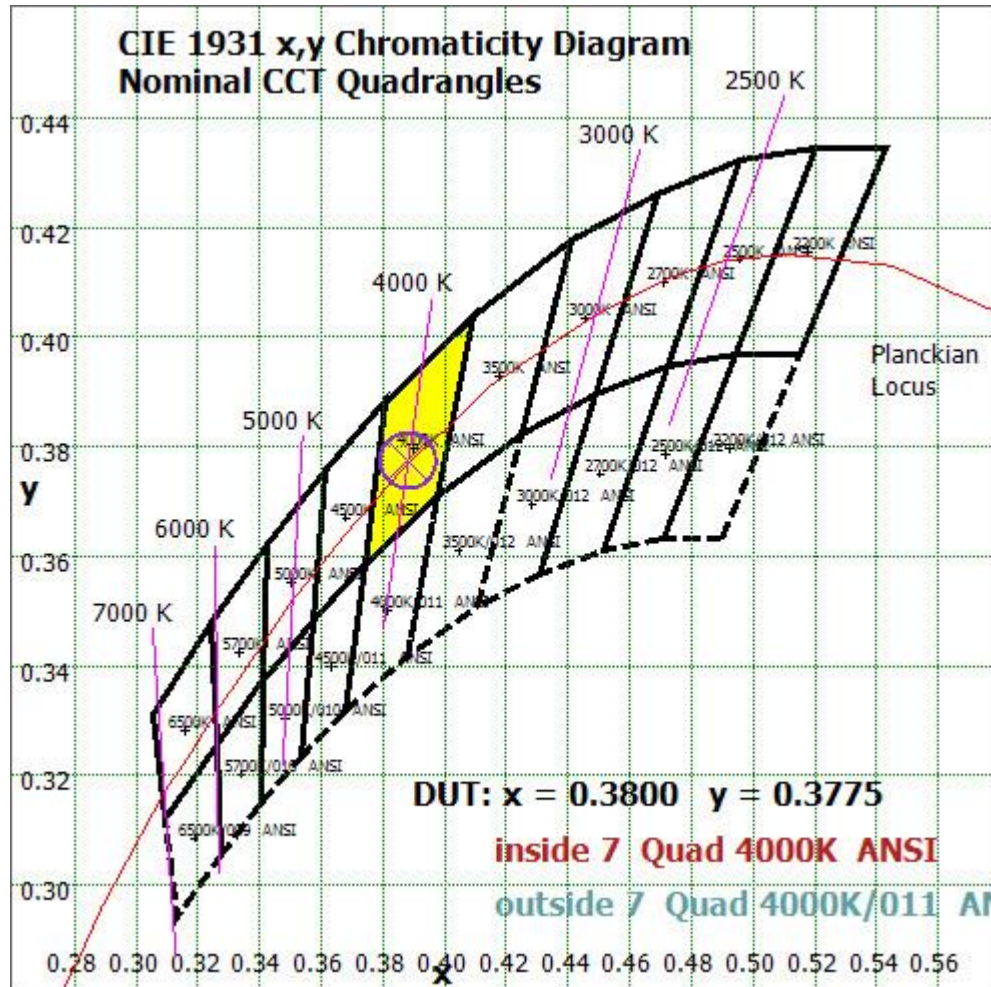


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

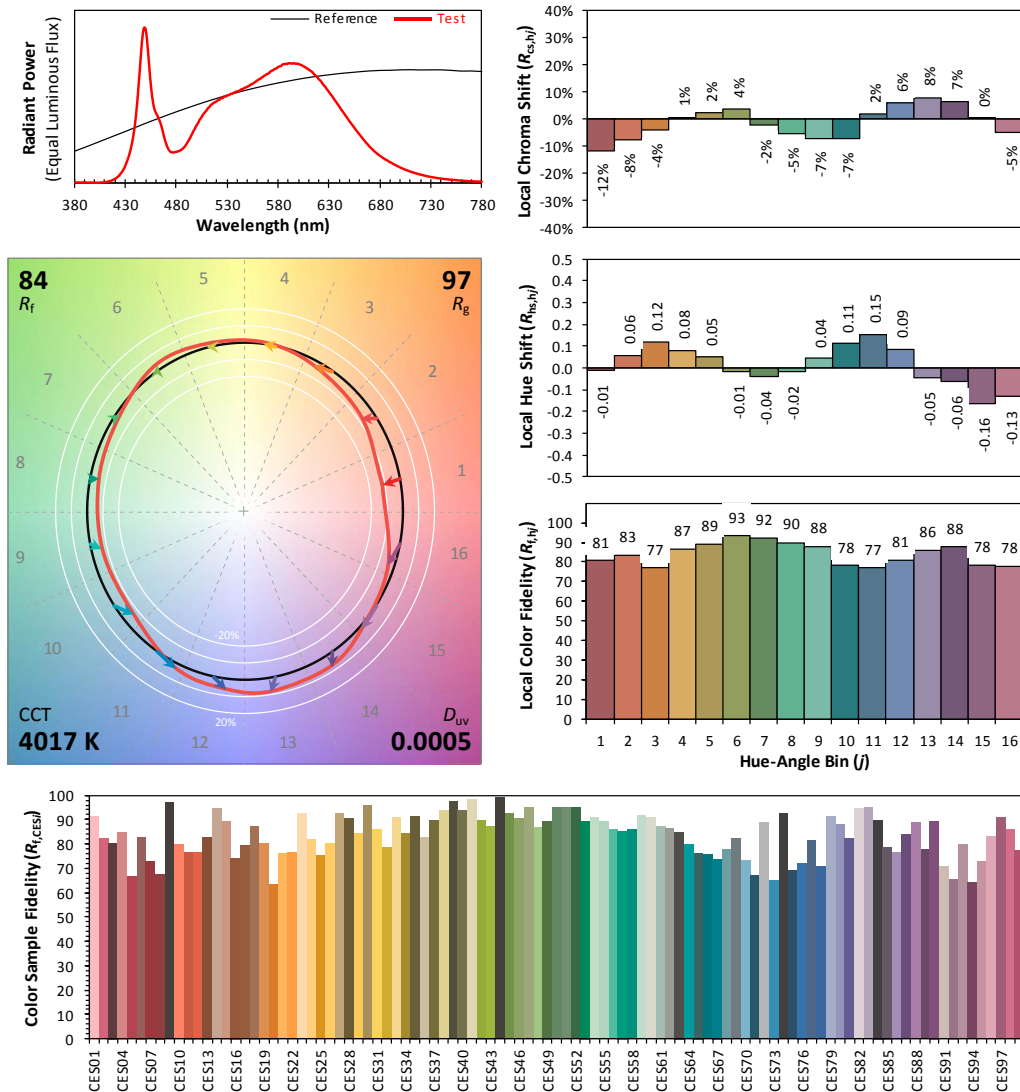
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/21

Model: ULB3-30L-U-40-L4



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

x 0.3800
 y 0.3775
 u' 0.2245
 v' 0.5018

CIE 13.3-1995
(CRI)

R_a 83
 R_g 9

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	220.228	4.28%
10- 20	629.774	12.25%
20- 30	949.593	18.48%
30- 40	1119.976	21.79%
40- 50	1008.813	19.63%
50- 60	616.642	12.00%
60- 70	331.807	6.46%
70- 80	186.224	3.62%
80- 90	66.252	1.29%
90-100	0.948	0.02%
100-110	1.492	0.03%
110-120	1.301	0.03%
120-130	1.515	0.03%
130-140	1.698	0.03%
140-150	1.485	0.03%
150-160	1.087	0.02%
160-170	0.676	0.01%
170-180	0.206	0.00%
Total	5139.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	4545.026	88.43%
60- 90	584.283	11.37%
0-90	5129.309	99.80%
90- 180	10.408	0.20%
0- 180	5139.7	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

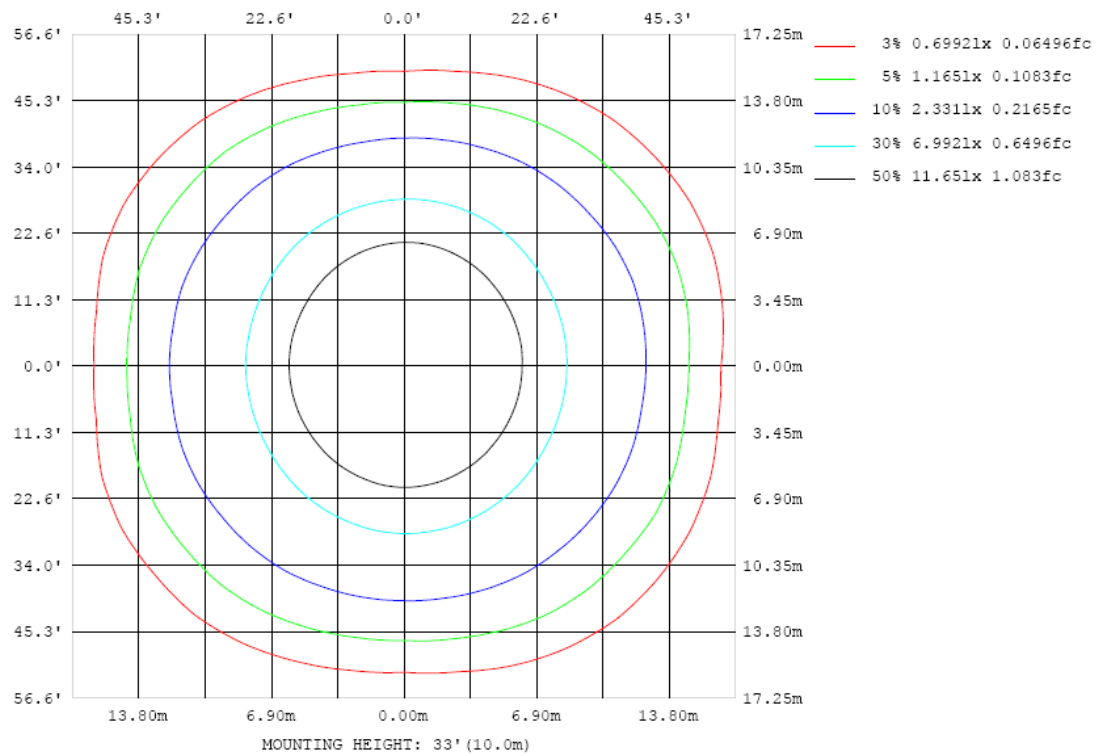


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

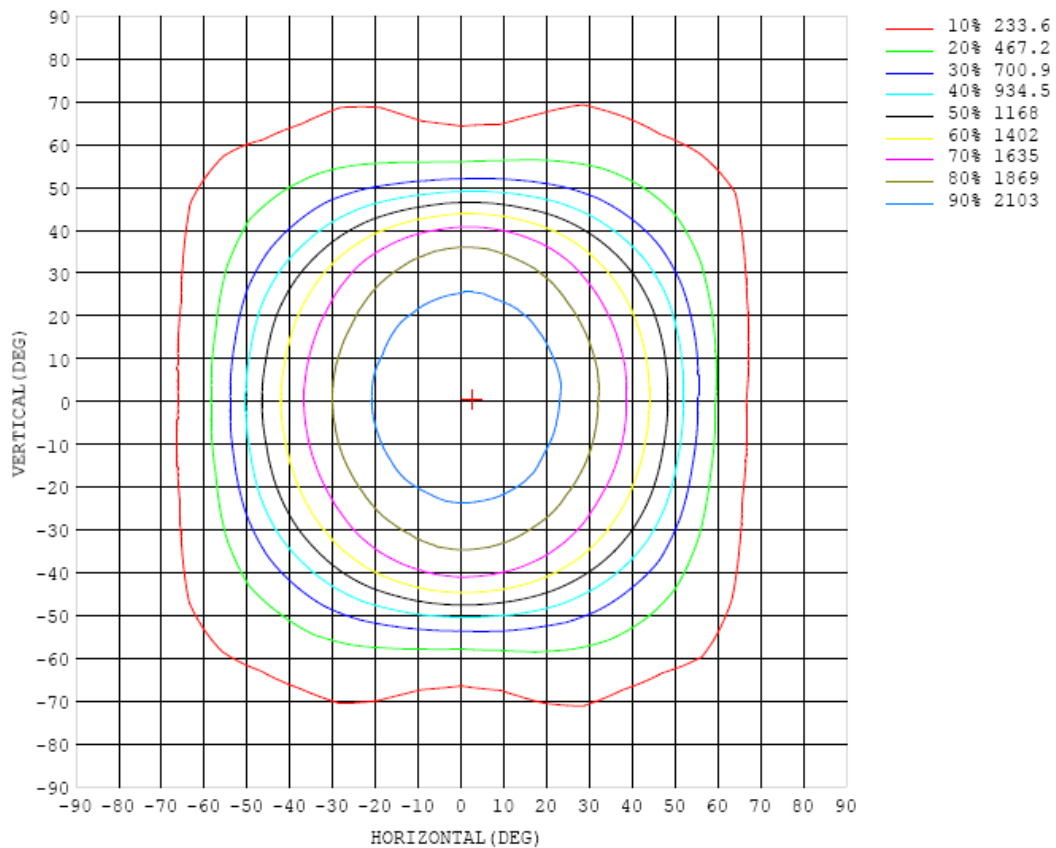


Chart 6: Isocandela Plot

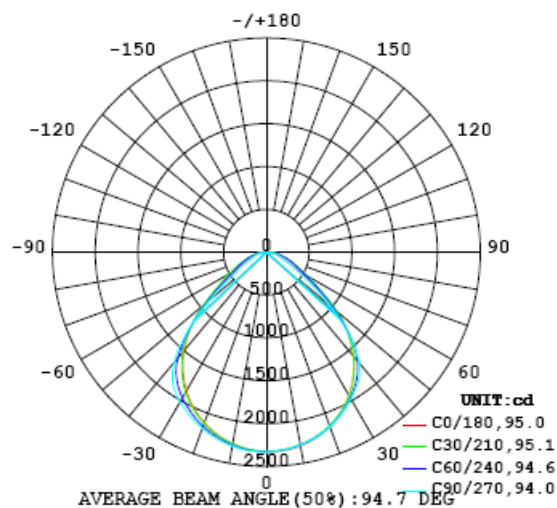


Chart 7: Polar Candela Distribution

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	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331
5	2323	2321	2317	2313	2320	2324	2317	2316	2312	2320	2316	2304	2306	2318	2306	2306	2314	2319	2309
10	2294	2288	2293	2278	2281	2293	2281	2283	2278	2283	2285	2273	2277	2271	2267	2269	2267	2272	2273
15	2240	2239	2229	2231	2235	2236	2237	2237	2238	2238	2234	2226	2213	2220	2208	2201	2207	2206	2208
20	2161	2156	2160	2155	2166	2173	2169	2171	2167	2171	2162	2143	2152	2143	2128	2124	2117	2122	2121
25	2061	2054	2059	2055	2062	2076	2073	2077	2078	2076	2076	2063	2044	2039	2026	2014	2010	2006	2010
30	1929	1931	1930	1937	1948	1955	1965	1974	1977	1979	1970	1948	1937	1919	1894	1882	1875	1868	1870
35	1773	1767	1780	1777	1794	1816	1833	1849	1854	1860	1847	1819	1796	1766	1732	1714	1701	1701	1700
40	1582	1581	1577	1580	1604	1634	1653	1674	1683	1684	1674	1645	1609	1575	1539	1510	1497	1492	1500
45	1352	1345	1351	1363	1374	1377	1389	1388	1382	1381	1362	1342	1334	1310	1282	1271	1254	1244	1257
50	1068	1054	1071	1074	1062	1049	1035	1008	979	964	967	972	989	987	981	987	983	955	959
55	732	733	766	772	760	750	723	685	644	615	627	657	693	713	711	715	699	657	643
60	441	458	514	543	548	543	513	470	414	385	404	442	482	510	510	517	489	426	405
65	272	293	360	396	395	392	384	344	284	260	277	320	363	368	365	382	357	288	257
70	176	197	263	294	275	277	291	255	204	185	204	244	278	271	261	283	266	200	173
75	131	145	198	215	189	190	210	190	156	145	153	188	205	186	187	202	204	160	143
80	102	117	153	145	122	123	140	137	120	113	118	136	140	124	115	134	145	130	105
85	62.2	74.8	85.3	82.0	67.0	66.9	73.7	74.1	66.0	63.1	66.4	71.5	69.2	63.3	56.5	69.1	76.5	68.6	60.3
90	3.40	1.86	3.50	3.74	3.05	2.57	6.24	4.49	3.72	2.93	2.87	3.03	3.13	2.93	2.66	2.24	1.65	3.92	1.53
95	0.55	0.64	0.78	0.78	0.56	0.50	0.41	0.34	0.27	0.25	0.27	0.29	0.35	0.43	0.53	0.71	0.87	0.97	0.68
100	0.56	0.55	0.70	1.60	1.63	1.59	1.67	1.40	1.30	1.40	1.39	1.27	1.18	1.11	0.96	1.00	0.98	1.05	1.78
105	0.83	0.99	0.88	1.01	1.10	1.71	2.23	1.94	1.83	1.72	1.58	1.44	1.30	0.96	1.09	0.99	1.10	1.17	1.62
110	1.05	1.23	1.09	1.17	1.22	1.17	1.14	1.23	1.38	1.37	1.25	1.01	0.94	0.97	1.14	1.05	1.26	1.26	1.35
115	1.40	1.75	1.63	1.40	1.39	1.29	1.30	1.13	1.07	1.05	1.02	1.00	1.05	1.02	1.21	1.09	1.48	1.38	1.38
120	1.75	1.96	1.47	1.70	1.69	1.65	1.43	1.22	1.17	1.17	1.14	1.11	1.18	1.28	1.35	1.20	1.56	1.73	1.54
125	1.91	2.15	1.82	2.29	2.14	1.91	1.93	1.61	1.40	1.35	1.34	1.35	1.44	1.47	1.60	1.39	1.39	1.99	1.64
130	1.17	1.50	2.55	1.62	2.87	2.29	2.27	2.07	1.73	1.66	1.60	1.67	1.71	1.69	1.94	1.60	1.43	1.80	1.60
135	1.60	2.69	3.07	1.25	2.92	3.08	2.46	2.37	2.30	2.05	1.95	1.95	1.93	2.06	1.98	1.36	1.51	1.93	1.64
140	1.67	2.85	3.06	3.13	1.48	3.01	3.13	2.80	2.62	2.56	2.40	2.30	2.24	1.97	1.28	1.67	2.11	1.99	1.46
145	1.55	2.59	2.99	3.30	3.03	1.57	2.15	2.62	2.68	2.43	2.36	2.39	2.12	1.36	1.56	2.07	2.24	2.20	1.56
150	1.70	2.76	3.01	3.32	3.60	2.27	1.52	1.45	1.61	1.96	1.79	1.38	1.44	1.67	2.04	2.31	2.26	2.17	1.68
155	1.81	2.43	3.00	3.22	2.49	2.30	3.34	2.92	2.14	1.75	1.83	1.95	2.10	2.18	1.98	2.18	2.22	2.23	1.75
160	1.70	1.79	2.09	2.34	2.61	3.25	3.39	3.16	2.93	2.76	2.60	2.30	2.41	2.22	2.35	2.28	1.95	1.92	1.67
165	1.77	1.83	2.32	2.55	2.84	2.81	2.93	2.79	2.72	2.53	2.40	2.42	2.41	2.41	2.10	1.92	1.99	1.95	1.71
170	1.89	1.91	2.04	2.42	2.49	2.43	2.44	2.45	2.40	2.36	2.31	2.42	2.16	2.07	1.97	1.99	2.03	1.96	1.80
175	2.04	2.08	2.11	2.18	2.25	2.27	2.23	2.31	2.33	2.33	2.14	2.04	2.15	2.36	2.32	2.22	2.14	2.07	1.99
180	2.00	2.05	2.06	2.05	2.06	2.08	2.05	2.05	1.94	1.94	1.95	2.02	2.00	2.02	2.00	2.00	2.00	1.96	1.99

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	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331	2331		
5	2309	2315	2303	2313	2327	2318	2321	2318	2328	2332	2319	2327	2334	2324	2326	2329	2333		
10	2272	2270	2275	2282	2285	2289	2289	2291	2295	2298	2296	2298	2304	2301	2299	2304	2302		
15	2212	2218	2212	2218	2229	2234	2240	2245	2253	2258	2254	2256	2253	2247	2249	2248	2250		
20	2123	2126	2123	2138	2161	2162	2173	2180	2192	2199	2183	2184	2192	2178	2173	2176	2177		
25	2013	2019	2025	2044	2057	2075	2087	2098	2107	2108	2105	2107	2096	2087	2079	2071	2072		
30	1877	1884	1889	1912	1942	1963	1988	2006	2020	2023	2013	1994	1992	1965	1955	1951	1946		
35	1700	1706	1719	1753	1795	1823	1855	1882	1902	1904	1881	1874	1846	1821	1802	1789	1789		
40	1494	1500	1524	1551	1581	1611	1636	1657	1676	1684	1684	1671	1657	1626	1609	1597	1592		
45	1247	1260	1263	1259	1269	1272	1268	1272	1301	1321	1339	1360	1367	1366	1369	1365	1362		
50	949	974	957	935	928	907	870	846	852	878	917	972	1008	1038	1073	1089	1080		
55	651	685	685	668	656	616	565	522	506	538	595	647	698	725	764	784	765		
60	424	481	503	488	467	431	388	344	326	348	406	454	494	518	538	531	493		
65	283	352	379	339	330	329	291	244	221	234	288	348	363	372	393	384	325		
70	195	259	273	240	236	253	231	183	161	168	213	262	265	258	280	284	215		
75	152	200	189	171	159	180	173	139	127	131	158	190	179	175	197	212	157		
80	119	142	123	101	97.4	111	113	102	92.5	95.9	110	124	114	103	134	155	124		
85	64.7	71.8	59.3	45.6	41.9	46.1	48.7	46.1	42.9	46.0	54.4	58.4	57.8	57.2	74.9	80.5	77.5		
90	1.62	3.45	0.56	0.81	0.54	0.37	0.26	0.19	0.19	0.20	0.23	0.27	0.36	0.64	0.88	0.90	0.94		
95	1.02	1.28	0.93	1.34	0.85	0.59	0.45	0.38	0.34	0.35	0.37	0.44	0.50	0.56	0.65	0.79	0.89		
100	1.69	2.31	1.05	1.50	1.25	1.10	1.18	1.55	1.57	1.44	1.46	1.71	1.39	1.50	1.59	0.71	0.63		
105	1.72	2.25	1.11	1.45	1.48	1.70	1.66	1.54	1.61	1.74	1.89	2.14	2.29	1.94	1.16	0.81	1.11		
110	1.64	1.62	1.03	1.45	1.26	1.34	1.48	1.71	1.84	1.89	1.81	1.65	1.37	1.35	1.30	0.94	1.21		
115	1.67	1.58	1.19	1.37	1.29	1.17	1.08	1.10	1.11	1.10	1.11	1.29	1.33	1.48	1.59	1.01	1.77		
120	1.69	1.44	1.23	1.60	1.42	1.28	1.26	1.25	1.24	1.23	1.33	1.40	1.69	1.71	1.89	1.16	2.25		
125	1.81	1.50	1.42	1.76	1.63	1.60	1.47	1.48	1.52	1.56	1.60	2.03	1.84	2.15	2.44	1.11	2.19		
130	1.71	1.74	1.49	1.96	1.91	1.81	1.93	1.91	1.96	2.09	2.27	2.41	2.44	2.87	2.53	2.27	1.42		
135	1.92	1.66	1.31	2.10	2.25	2.22	2.28	2.29	2.51	2.63	2.68	2.97	3.23	2.84	1.47	2.95	2.69		
140	1.83	2.13	1.87	1.65	2.47	2.68	2.88	2.72	3.10	3.15	3.13	3.18	3.06	1.66	2.68	3.16	2.86		
145	2.00	2.24	2.23	1.96	1.85	2.29	2.60	2.91	2.86	3.01	2.81	2.78	1.76	2.09	3.20	2.88	2.61		
150	2.09	2.22	2.43	2.37	2.03	1.72	1.98	2.30	2.44	2.27	1.84	1.70	1.80	3.36	3.32	2.99	2.81		
155	2.10	2.26	2.38	2.20	2.48	2.47	2.34	2.03	2.02	2.09	2.52	3.07	2.59	2.34	2.83	2.91	2.74		
160	1.88	2.01	2.04	2.37	2.72	2.75	2.66	2.77	2.88	3.12	3.27	3.31	3.23	2.96	2.44	2.20	2.15		
165	1.79	1.96	2.00	1.95	2.26	2.54	2.62	2.61	2.62	2.80	2.86	2.84	2.89	2.73	2.56	2.41	2.17		
170	1.80	1.90	1.95	1.97	1.97	2.11	2.24	2.46	2.37	2.38	2.40	2.39	2.38	2.28	2.32	2.30	2.09		
175	1.99	2.09	2.22	2.33	2.37	2.34	2.12	2.02	2.04	2.23	2.20	2.19	2.11	2.15	2.23	2.16	2.07		
180	1.99	2.02	2.04	2.06	2.07	2.07	2.05	2.03	1.92	1.92	1.89	2.01	2.02	2.03	2.00	2.00	2.01		

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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