



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-L3

ULB3-30L-U-40-L3-MWS

30LB/3F/840/U/A3

30LB/3F/840/U/A3/MWS

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ25030014n

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: **ULB3-30L-U-40-L3**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
131.8	5148.6	39.06	0.9961
CCT (K)	CRI	Stabilization Time (Light & Power)	
4016	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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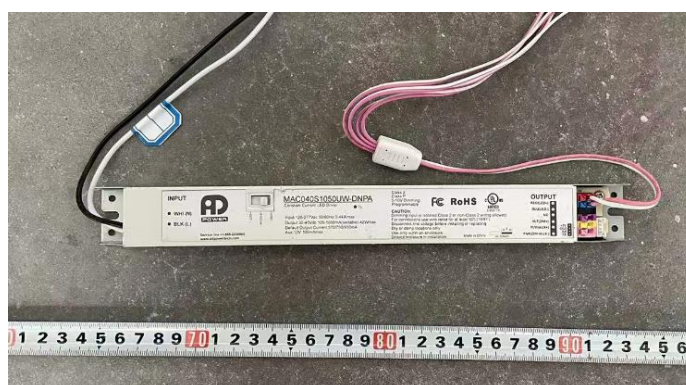
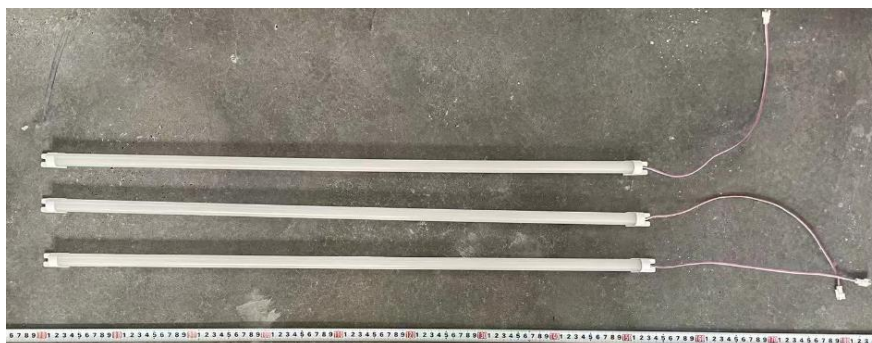


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x4

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB3-30L-U-40-L3	ULB3-30L-U-40-L3-MWS
	30LB/3F/840/U/A3	30LB/3F/840/U/A3/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)	0.327	0.146
Power Factor	0.9961	0.9622
Test Power (W)	39.06	38.81
THD A%	7.16	14.96
Luminous Efficacy (lm/W)	131.8	133.1
Total Luminous Flux (lm)	5148.6	5166.1
Color Rendering Index (CRI)	82.9	
R9	9.2	
Correlated Color Temperature (CCT)(K)	4016	
Chromaticity Chroma x	0.3799	
Chromaticity Chroma y	0.3773	
Chromaticity Chroma u	0.2245	
Chromaticity Chroma v	0.3345	
Duv	0.0004	
Chromaticity Chroma u'	0.2245	
Chromaticity Chroma v'	0.5017	

Special Color Rendering Indices	
R1	81.3
R2	88.3
R3	93.8
R4	82.6
R5	81.4
R6	83.9
R7	86.3
R8	65.3
R9	9.2
R10	72.5
R11	82
R12	60.9
R13	82.9
R14	96.7

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)	39.07
Luminous Efficacy (lm/W)	132.0
Total Luminous Flux (lm)	5158.6
Beam Angle (°)	95.2 (0°-180°) / 94.7 (90°-270°)
Center Beam Candle Power (cd)	2327
Maximum Beam Candle Power (cd)	2331 (At: C=20.0, Gamma=0.5)
Spacing Criteria	1.20 (0°-180°) / 1.27 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	88.33%
Zonal Lumens in the 60 °-90 °Zone	11.44%
Zonal Lumens in the 90 °-120 °Zone	0.08%
Zonal Lumens in the 120 °-180 °Zone	0.15%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

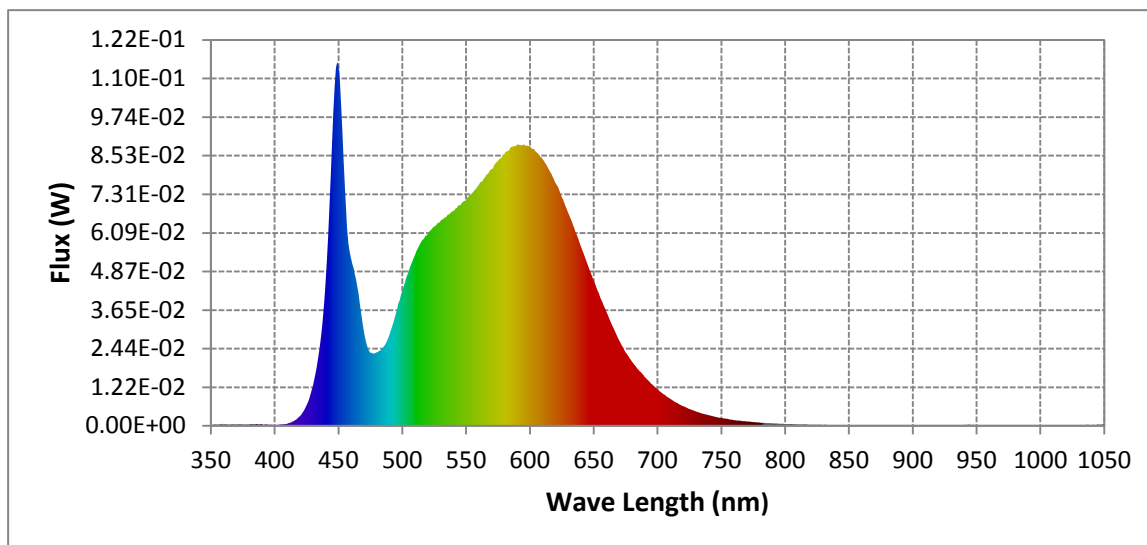
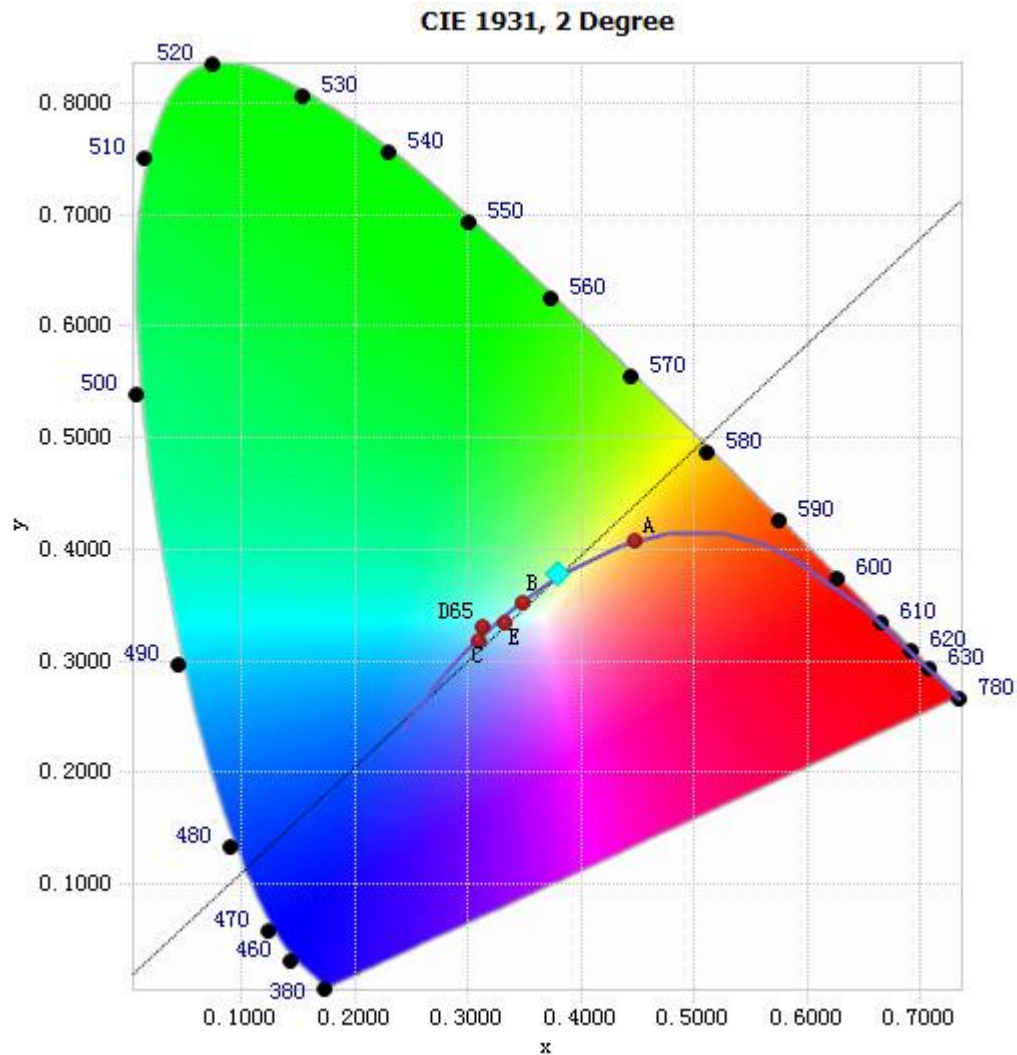


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	5.70E-04	485	2.47E-02	590	8.88E-02	695	1.34E-02
385	4.25E-04	490	2.87E-02	595	8.89E-02	700	1.16E-02
390	5.12E-04	495	3.54E-02	600	8.82E-02	705	9.93E-03
395	3.42E-04	500	4.24E-02	605	8.63E-02	710	8.50E-03
400	3.04E-04	505	4.86E-02	610	8.41E-02	715	7.29E-03
405	4.03E-04	510	5.39E-02	615	8.09E-02	720	6.24E-03
410	6.50E-04	515	5.81E-02	620	7.69E-02	725	5.34E-03
415	1.51E-03	520	6.05E-02	625	7.23E-02	730	4.55E-03
420	3.06E-03	525	6.29E-02	630	6.73E-02	735	3.92E-03
425	6.41E-03	530	6.47E-02	635	6.22E-02	740	3.35E-03
430	1.26E-02	535	6.61E-02	640	5.67E-02	745	2.89E-03
435	2.38E-02	540	6.78E-02	645	5.13E-02	750	2.47E-03
440	4.57E-02	545	6.95E-02	650	4.58E-02	755	2.14E-03
445	8.94E-02	550	7.12E-02	655	4.07E-02	760	1.81E-03
450	1.14E-01	555	7.35E-02	660	3.60E-02	765	1.58E-03
455	7.54E-02	560	7.59E-02	665	3.13E-02	770	1.37E-03
460	5.30E-02	565	7.84E-02	670	2.69E-02	775	1.20E-03
465	4.38E-02	570	8.10E-02	675	2.32E-02	780	1.04E-03
470	3.00E-02	575	8.35E-02	680	2.02E-02		
475	2.31E-02	580	8.56E-02	685	1.77E-02		
480	2.32E-02	585	8.79E-02	690	1.55E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3799, 0.3773)

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

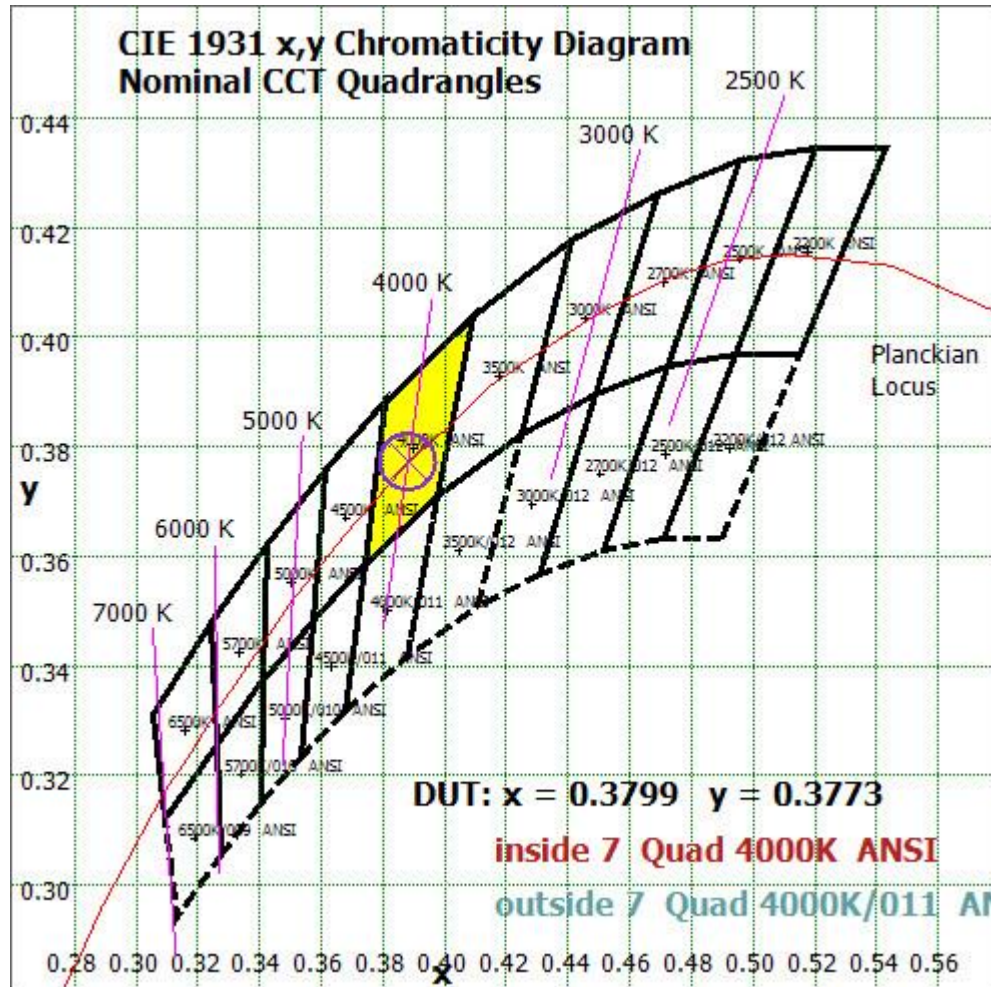


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

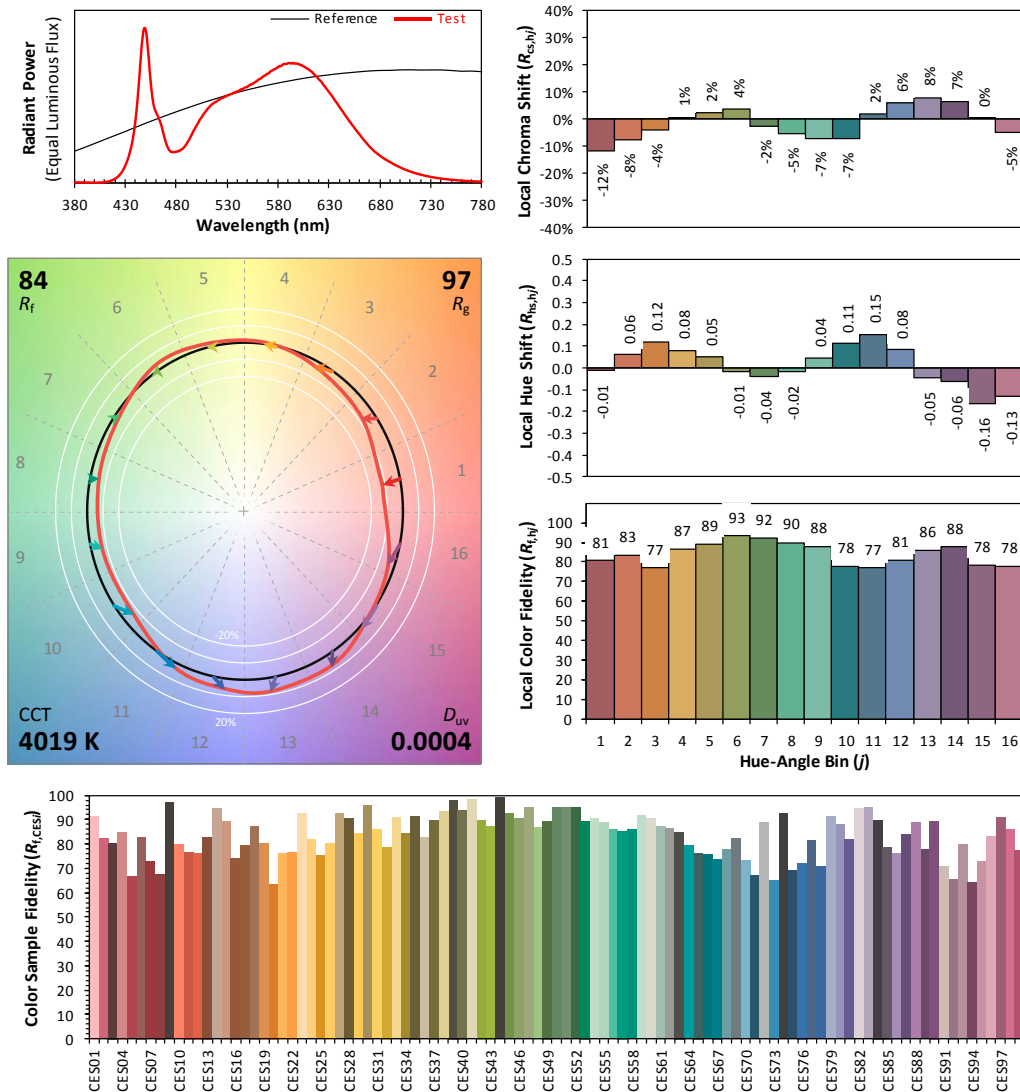
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/21

Model: ULB3-30L-U-40-L3



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

x 0.3799
 y 0.3772
 u' 0.2245
 v' 0.5017

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	220.097	4.27%
10- 20	629.396	12.20%
20- 30	948.542	18.39%
30- 40	1117.948	21.67%
40- 50	1016.297	19.70%
50- 60	624.17	12.10%
60- 70	335.16	6.50%
70- 80	187.718	3.64%
80- 90	67.089	1.30%
90-100	1.006	0.02%
100-110	1.714	0.03%
110-120	1.648	0.03%
120-130	1.81	0.04%
130-140	1.95	0.04%
140-150	1.725	0.03%
150-160	1.241	0.02%
160-170	0.824	0.02%
170-180	0.258	0.01%
Total	5158.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	4556.45	88.33%
60- 90	589.967	11.44%
0-90	5146.417	99.76%
90- 180	12.176	0.24%
0- 180	5158.6	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

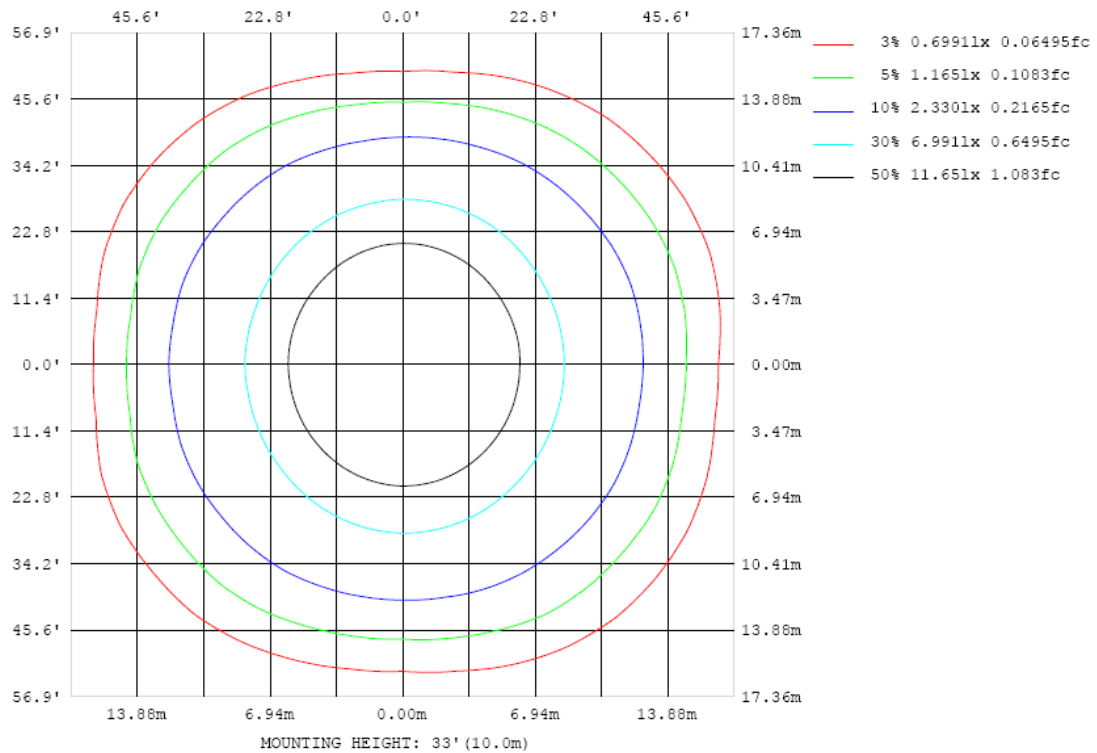


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

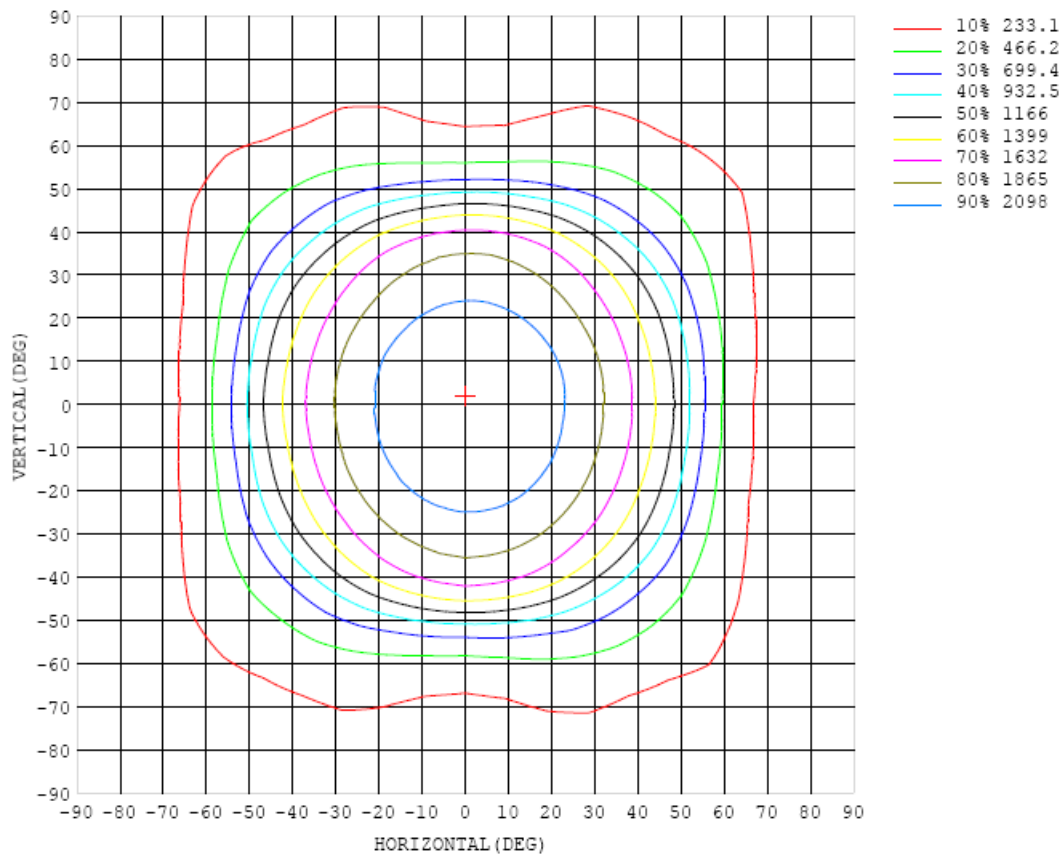


Chart 6: Isocandela Plot

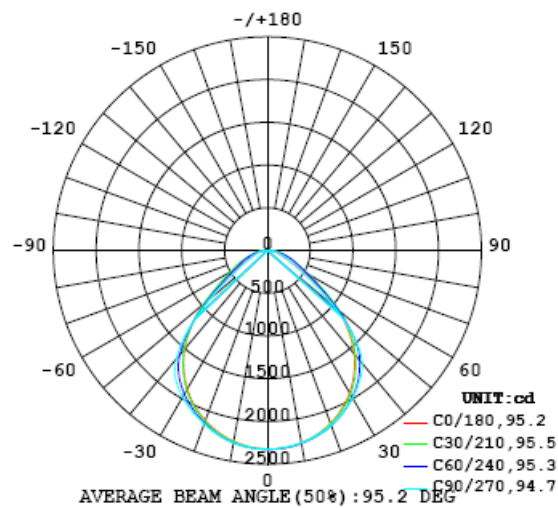


Chart 7: Polar Candela Distribution

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	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327
5	2312	2319	2330	2312	2318	2319	2321	2317	2323	2314	2320	2313	2314	2311	2311	2307	2316	2307	2308
10	2288	2284	2296	2285	2288	2291	2289	2291	2288	2280	2284	2278	2280	2276	2269	2270	2270	2272	2265
15	2232	2234	2237	2236	2239	2243	2244	2244	2249	2246	2244	2233	2231	2222	2219	2214	2212	2203	2211
20	2151	2157	2169	2157	2169	2175	2185	2183	2187	2177	2175	2169	2162	2149	2136	2127	2130	2125	2116
25	2053	2048	2063	2066	2076	2086	2090	2099	2101	2093	2095	2079	2072	2056	2041	2030	2013	2005	2009
30	1924	1928	1938	1944	1958	1972	1986	1989	2000	1997	1984	1971	1954	1932	1912	1895	1891	1878	1873
35	1764	1769	1787	1786	1806	1830	1850	1867	1878	1870	1868	1838	1812	1782	1750	1727	1713	1699	1703
40	1578	1576	1588	1599	1622	1649	1678	1705	1724	1725	1707	1673	1639	1590	1552	1525	1506	1499	1505
45	1350	1349	1358	1374	1393	1407	1431	1438	1445	1434	1421	1397	1376	1337	1302	1281	1269	1245	1264
50	1065	1057	1083	1091	1089	1081	1076	1056	1024	1001	1008	1011	1029	1018	1005	1000	988	958	968
55	733	733	775	791	781	773	751	708	670	633	650	673	714	731	724	727	712	662	650
60	444	459	516	549	560	558	531	487	431	397	416	455	492	523	521	523	495	430	410
65	273	290	360	402	404	400	394	358	296	267	282	326	370	374	371	388	362	292	259
70	178	194	260	300	281	281	298	264	212	189	206	246	282	277	266	285	272	204	174
75	131	143	196	219	193	192	213	196	161	148	154	191	210	191	189	203	207	163	144
80	102	114	153	148	127	123	142	141	123	115	120	137	143	126	115	136	146	132	106
85	63.7	73.9	87.1	84.0	69.9	67.5	75.2	76.8	69.5	64.4	69.3	74.1	71.5	63.9	56.9	69.2	77.0	69.6	60.4
90	3.70	2.05	3.92	3.98	3.59	2.75	6.03	4.34	3.51	2.88	2.69	2.97	2.89	2.77	2.40	2.32	0.78	2.91	1.63
95	0.53	0.72	0.83	0.85	0.66	0.62	0.48	0.41	0.33	0.29	0.29	0.30	0.37	0.45	0.57	0.76	0.90	0.97	0.78
100	0.61	0.58	0.71	1.54	1.49	1.46	1.71	1.43	1.26	1.27	0.84	0.82	0.93	0.99	1.14	1.11	1.15	1.21	1.42
105	0.99	1.04	0.94	1.78	2.04	2.25	2.06	1.80	1.62	1.51	1.46	1.43	1.50	1.49	1.52	1.28	1.43	1.48	2.18
110	1.29	1.24	1.20	1.30	1.89	2.19	2.17	2.04	2.04	1.97	1.86	1.74	1.72	1.72	1.61	1.37	1.69	1.93	2.30
115	1.58	1.58	1.61	1.63	1.57	1.63	2.20	2.22	2.14	2.07	2.02	1.97	1.79	1.50	1.71	1.58	1.99	1.51	1.88
120	2.00	1.92	1.72	1.93	1.90	2.06	1.82	1.68	1.71	1.75	1.68	1.63	1.69	1.82	2.05	1.81	2.41	1.99	1.84
125	2.24	2.23	1.82	2.48	2.33	2.25	2.32	2.03	1.99	1.92	1.94	1.95	2.07	2.26	2.26	2.10	1.97	2.32	1.96
130	1.28	1.54	2.37	1.84	2.73	2.60	2.71	2.56	2.40	2.26	2.26	2.35	2.45	2.41	2.59	2.51	1.49	1.93	1.66
135	1.99	2.95	3.10	1.33	3.08	3.05	3.03	2.92	2.79	2.62	2.54	2.65	2.72	2.74	2.72	1.73	1.79	2.27	1.87
140	2.08	3.16	3.16	2.89	1.74	3.18	3.38	3.13	3.24	3.10	3.00	3.01	2.98	2.93	1.96	1.89	2.55	2.24	1.46
145	1.78	3.11	3.24	3.11	2.66	1.82	2.47	3.36	3.36	3.49	3.39	3.19	2.92	1.99	1.60	2.58	2.83	2.71	1.60
150	1.79	3.30	3.41	3.40	3.27	2.21	2.02	1.81	2.10	2.24	2.20	1.95	2.04	1.64	2.62	2.90	2.94	2.86	1.71
155	1.88	2.89	3.59	3.44	2.48	2.49	3.07	2.76	2.33	1.87	2.01	2.05	2.62	2.72	2.05	2.29	2.95	2.91	1.79
160	1.70	1.96	2.32	2.40	2.81	3.44	3.42	3.35	3.19	2.81	2.79	2.92	2.93	2.97	3.14	2.75	2.16	2.09	1.73
165	1.79	2.11	3.34	3.48	3.53	3.55	3.49	3.36	3.16	3.01	2.88	2.98	3.15	2.97	2.54	2.03	2.05	2.10	1.79
170	1.92	1.96	2.76	3.55	3.53	3.41	3.39	3.22	3.18	3.10	3.09	3.18	2.31	2.15	2.11	2.03	2.10	2.08	1.86
175	2.10	2.13	2.18	2.57	2.98	3.00	3.04	3.39	3.43	3.39	2.93	2.16	2.25	3.15	2.99	2.87	2.66	2.15	2.05
180	2.07	2.09	2.12	2.14	2.16	2.15	2.05	2.10	1.79	1.95	2.01	2.03	2.04	2.07	1.89	1.99	1.98	2.07	2.06

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	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327	2327		
5	2306	2319	2306	2313	2315	2315	2318	2322	2314	2325	2315	2323	2319	2317	2321	2325	2321		
10	2271	2278	2272	2276	2280	2286	2285	2288	2287	2290	2290	2295	2295	2296	2292	2299	2294		
15	2210	2212	2214	2222	2225	2229	2231	2237	2235	2242	2239	2242	2240	2239	2243	2245	2241		
20	2118	2137	2124	2135	2141	2148	2153	2161	2159	2166	2163	2168	2166	2164	2167	2170	2164		
25	2016	2023	2024	2030	2038	2054	2063	2076	2079	2086	2076	2076	2070	2066	2062	2069	2063		
30	1875	1883	1884	1903	1921	1940	1960	1979	1983	1984	1978	1971	1956	1940	1938	1939	1936		
35	1702	1715	1714	1737	1766	1800	1826	1848	1856	1869	1849	1834	1812	1795	1778	1776	1776		
40	1496	1501	1507	1534	1562	1595	1616	1641	1652	1659	1653	1646	1622	1596	1582	1582	1579		
45	1248	1259	1261	1260	1266	1276	1273	1276	1300	1320	1329	1348	1342	1348	1350	1345	1348		
50	953	976	961	937	927	917	880	859	862	887	916	968	999	1022	1056	1080	1069		
55	653	690	688	670	660	622	572	524	506	535	588	646	693	720	755	778	764		
60	424	480	503	494	471	435	390	347	326	346	402	450	492	515	534	531	495		
65	283	351	383	342	330	331	294	247	221	232	285	346	360	371	390	387	330		
70	195	258	276	241	236	254	232	186	160	167	210	259	266	258	277	287	218		
75	151	200	190	173	158	180	175	141	127	130	157	188	179	174	194	214	160		
80	118	144	123	103	96.2	112	114	103	92.8	95.8	109	124	115	102	133	154	128		
85	64.3	72.9	60.1	46.4	42.1	46.5	49.4	47.6	43.8	46.6	55.3	59.6	58.7	57.2	75.2	79.9	78.9		
90	3.27	6.69	0.59	0.81	0.55	0.39	0.27	0.20	0.19	0.20	0.23	0.27	0.33	0.63	0.89	1.12	0.96		
95	1.05	1.39	0.98	1.12	0.83	0.57	0.43	0.38	0.39	0.41	0.44	0.49	0.53	0.57	0.62	0.74	0.99		
100	2.30	2.21	1.08	1.97	2.30	2.23	1.96	2.05	1.97	2.00	1.96	2.05	2.32	1.80	1.58	0.75	0.68		
105	1.86	2.07	1.15	1.45	1.59	1.70	1.63	1.93	2.07	2.04	1.92	2.04	2.19	1.80	1.13	0.80	0.98		
110	1.53	2.32	1.25	1.49	1.38	1.43	1.70	1.83	1.85	1.90	1.85	1.46	1.25	1.35	1.35	0.99	1.32		
115	1.78	2.03	1.34	1.59	1.48	1.45	1.37	1.38	1.31	1.26	1.34	1.43	1.52	1.61	1.60	1.02	1.56		
120	2.23	1.58	1.48	1.78	1.70	1.66	1.70	1.66	1.70	1.61	1.63	1.72	1.72	1.85	1.84	1.22	1.93		
125	2.61	1.55	1.57	1.99	2.04	1.98	1.93	1.97	1.99	1.98	1.89	1.91	2.09	2.26	2.23	1.17	2.23		
130	2.27	1.83	1.42	2.31	2.10	2.22	2.23	2.31	2.30	2.41	2.32	2.59	2.37	2.55	2.55	2.05	1.57		
135	2.76	1.94	1.52	2.48	2.72	2.51	2.40	2.51	2.66	2.71	2.89	3.02	3.01	2.96	1.42	2.78	3.08		
140	2.12	2.68	2.36	1.77	2.92	2.87	2.95	2.91	3.06	3.23	3.58	3.44	3.56	1.70	2.44	3.16	3.34		
145	2.39	2.86	2.83	2.48	1.99	2.64	3.22	3.31	3.50	3.74	3.53	3.14	1.84	2.27	2.95	3.15	3.17		
150	2.78	3.14	3.15	2.97	2.34	1.91	2.19	1.96	2.32	1.96	1.88	1.69	2.06	3.33	3.39	3.48	3.42		
155	2.14	3.11	2.95	2.53	2.99	3.05	2.86	2.48	2.30	2.43	2.96	3.32	2.93	2.69	3.38	3.81	3.53		
160	1.95	2.24	2.64	2.95	3.47	3.23	3.15	3.10	3.16	3.28	3.45	3.79	3.79	3.68	2.87	2.76	2.50		
165	1.80	2.03	2.12	2.20	2.77	3.45	3.48	3.36	3.36	3.59	3.54	3.71	3.99	3.86	3.80	3.67	3.28		
170	1.84	1.95	1.99	2.07	2.04	2.30	2.62	3.51	3.36	3.41	3.50	3.57	3.61	3.58	3.62	3.57	2.82		
175	2.06	2.18	2.63	2.88	3.19	3.23	2.31	2.16	2.25	3.33	3.33	3.34	3.23	3.25	2.96	2.78	2.30		
180	2.05	2.09	2.11	2.12	2.12	2.13	2.11	2.10	1.97	1.95	1.96	2.08	2.09	2.10	2.08	2.08	2.08		

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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