

LM-79-19 TEST REPORT

for

Industrial Lighting Products, LLC

3224 McCraney Loop, Sanford, FL, 32771

LED Retrofit-kits in Lithonia 2GT8 lensed 2x2

Model: ULB2-20L-U-40-L4

ULB2-20L-U-40-L4-MWS

20LB/2F/840/U/A4

20LB/2F/840/U/A4/MWS

Laboratory: Leading Testing Laboratories

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Report No.: HZ25030014f

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: **ULB2-20L-U-40-L4**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
127.8	5062.4	39.62	0.9962
CCT (K)	CRI	Stabilization Time (Light & Power)	
4034	82.6	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. 18, 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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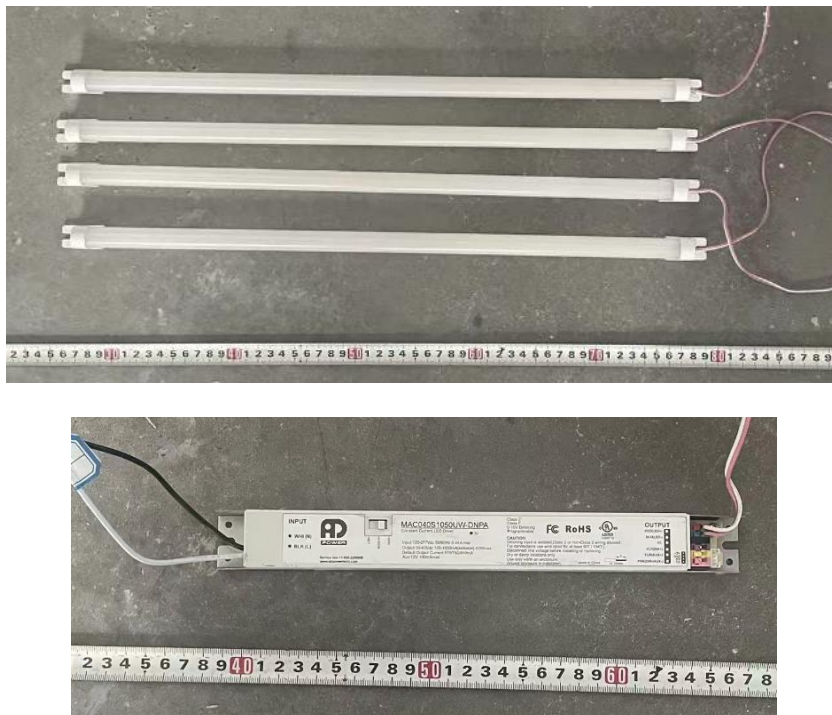
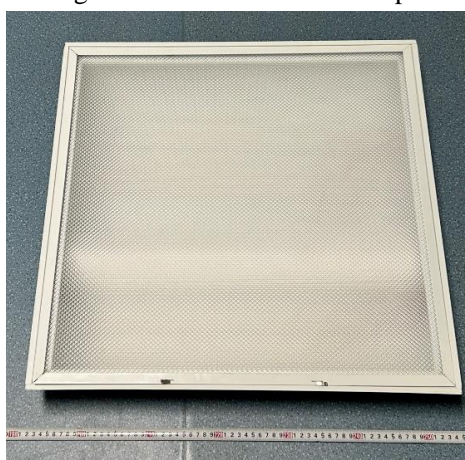


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x2

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB2-20L-U-40-L4	ULB2-20L-U-40-L4-MWS
	20LB/2F/840/U/A4	20LB/2F/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)	0.331	0.148
Power Factor	0.9962	0.9615
Test Power (W)	39.62	39.38
THD A%	6.88	14.88
Luminous Efficacy (lm/W)	127.8	129.1
Total Luminous Flux (lm)	5062.4	5082.5
Color Rendering Index (CRI)	82.6	
R9	8.9	
Correlated Color Temperature (CCT)(K)	4034	
Chromaticity Chroma x	0.3797	
Chromaticity Chroma y	0.3788	
Chromaticity Chroma u	0.2238	
Chromaticity Chroma v	0.3349	
Duv	0.0012	
Chromaticity Chroma u'	0.2238	
Chromaticity Chroma v'	0.5024	

Special Color Rendering Indices	
R1	80.9
R2	87.7
R3	93.3
R4	82.6
R5	81
R6	83.2
R7	86.6
R8	65.5
R9	8.9
R10	71.2
R11	82
R12	60.3
R13	82.4
R14	96.4

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)	39.63
Luminous Efficacy (lm/W)	128.1
Total Luminous Flux (lm)	5074.8
Beam Angle (°)	96.0 (0°-180°) / 87.9 (90°-270°)
Center Beam Candle Power (cd)	2259
Maximum Beam Candle Power (cd)	2261 (At: C=140.0, Gamma=0.5)
Spacing Criteria	1.25 (0°-180°) / 1.13 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	85.40%
Zonal Lumens in the 60 °-90 °Zone	14.11%
Zonal Lumens in the 90 °-120 °Zone	0.17%
Zonal Lumens in the 120 °-180 °Zone	0.33%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

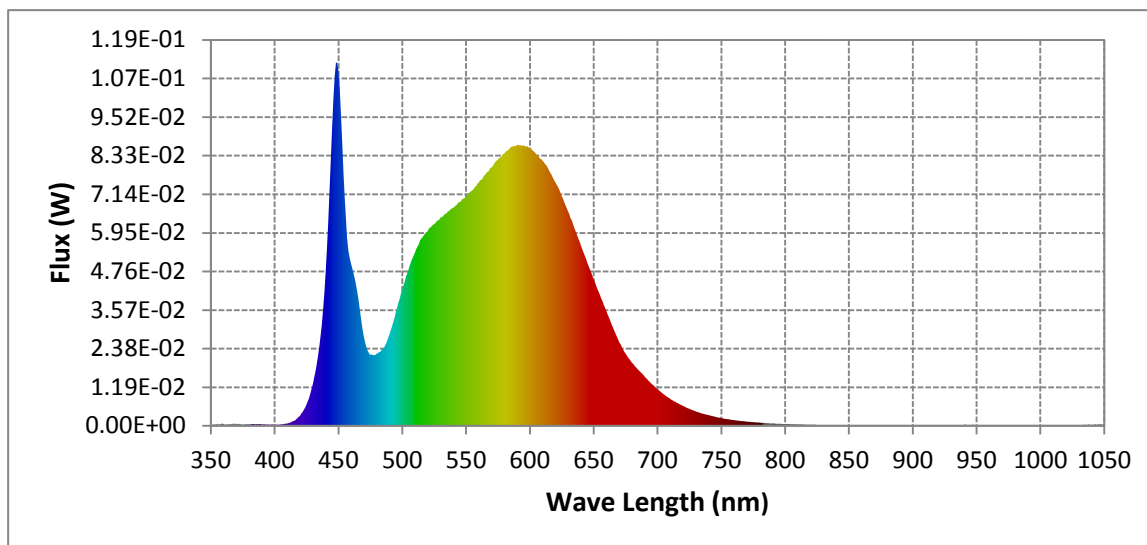
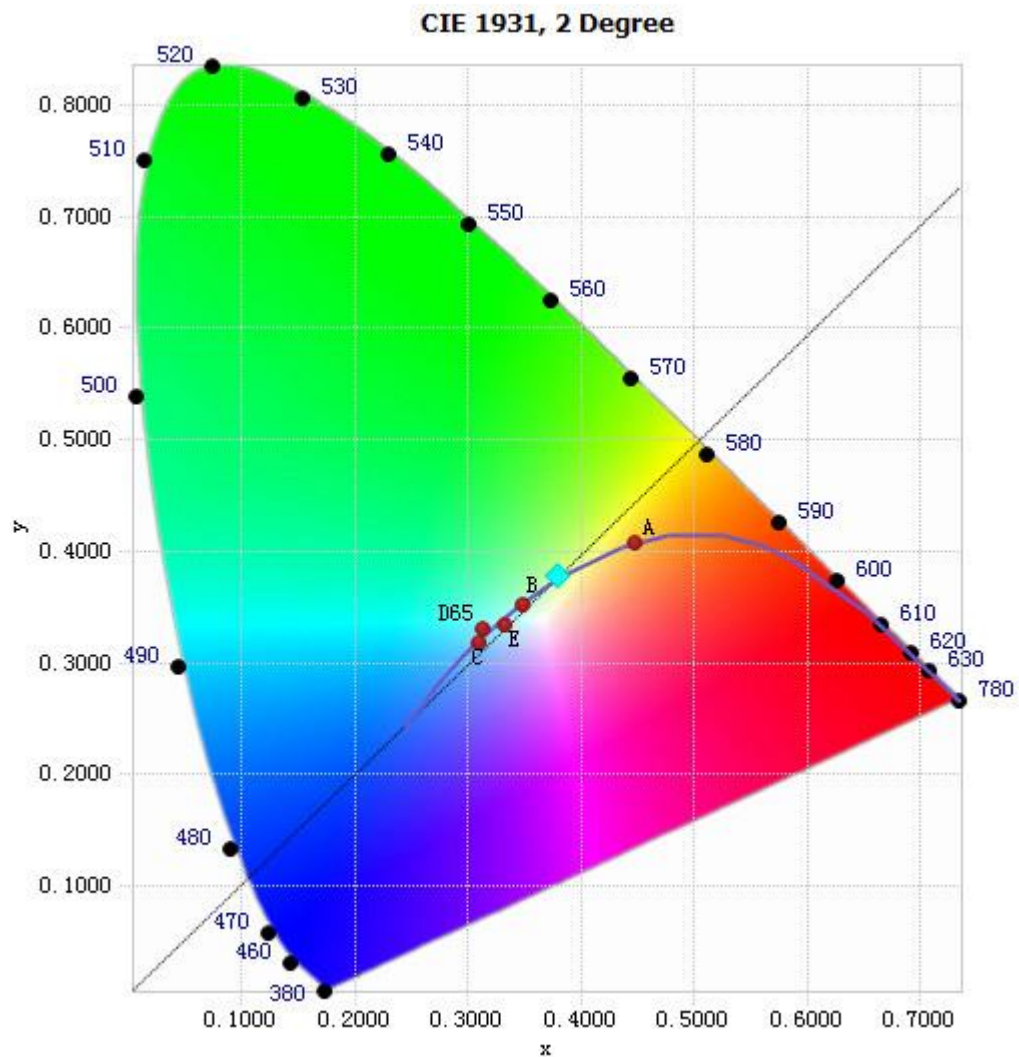


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	5.71E-04	485	2.38E-02	590	8.67E-02	695	1.32E-02
385	4.38E-04	490	2.81E-02	595	8.65E-02	700	1.13E-02
390	4.59E-04	495	3.49E-02	600	8.57E-02	705	9.77E-03
395	4.64E-04	500	4.20E-02	605	8.36E-02	710	8.33E-03
400	2.97E-04	505	4.82E-02	610	8.17E-02	715	7.12E-03
405	4.06E-04	510	5.34E-02	615	7.89E-02	720	6.15E-03
410	7.14E-04	515	5.77E-02	620	7.51E-02	725	5.24E-03
415	1.49E-03	520	6.00E-02	625	7.08E-02	730	4.49E-03
420	3.09E-03	525	6.22E-02	630	6.61E-02	735	3.82E-03
425	6.54E-03	530	6.42E-02	635	6.09E-02	740	3.28E-03
430	1.28E-02	535	6.55E-02	640	5.57E-02	745	2.79E-03
435	2.43E-02	540	6.72E-02	645	5.04E-02	750	2.40E-03
440	4.74E-02	545	6.89E-02	650	4.52E-02	755	2.07E-03
445	9.16E-02	550	7.05E-02	655	4.03E-02	760	1.76E-03
450	1.09E-01	555	7.26E-02	660	3.54E-02	765	1.52E-03
455	6.95E-02	560	7.49E-02	665	3.04E-02	770	1.32E-03
460	5.01E-02	565	7.73E-02	670	2.58E-02	775	1.13E-03
465	4.11E-02	570	7.97E-02	675	2.22E-02	780	9.96E-04
470	2.77E-02	575	8.20E-02	680	1.94E-02		
475	2.19E-02	580	8.39E-02	685	1.72E-02		
480	2.22E-02	585	8.59E-02	690	1.52E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3797, 0.3788)

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

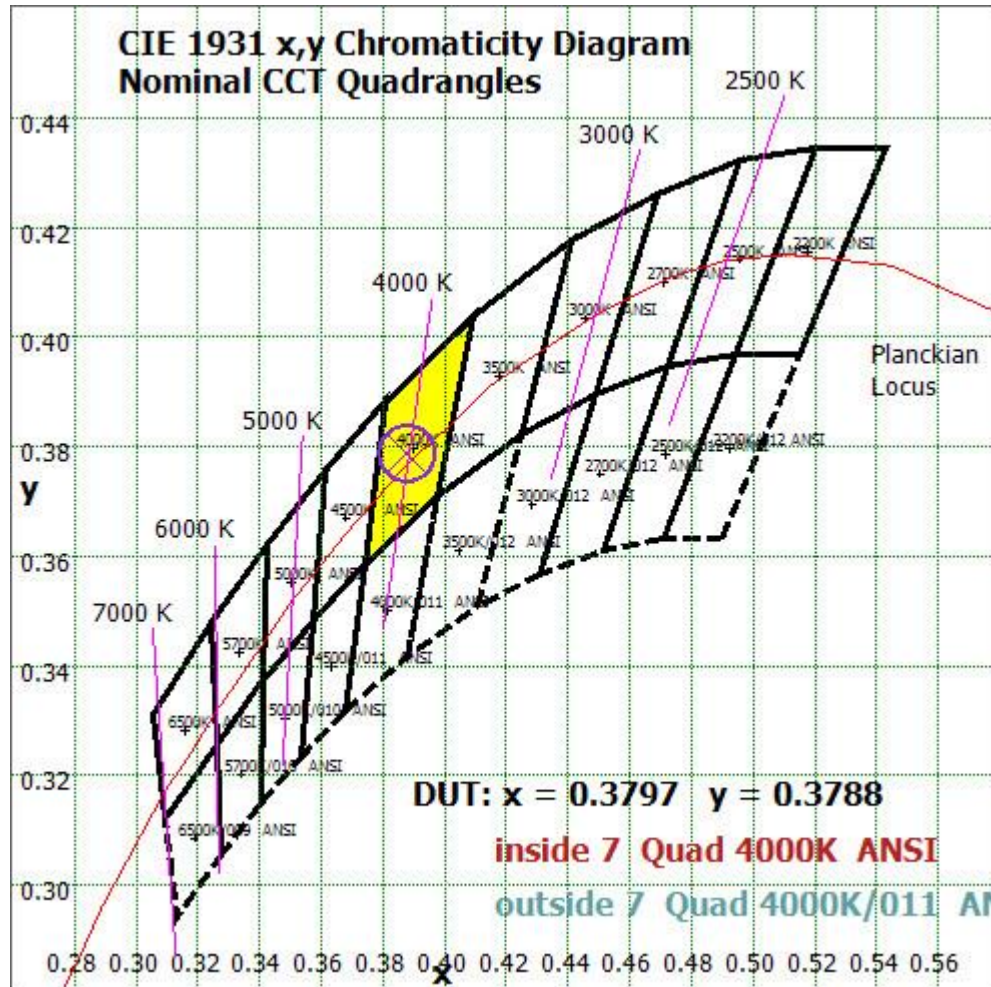


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram



Quality Assured
Color Rendition Report – Sphere Spectroradiometer Method

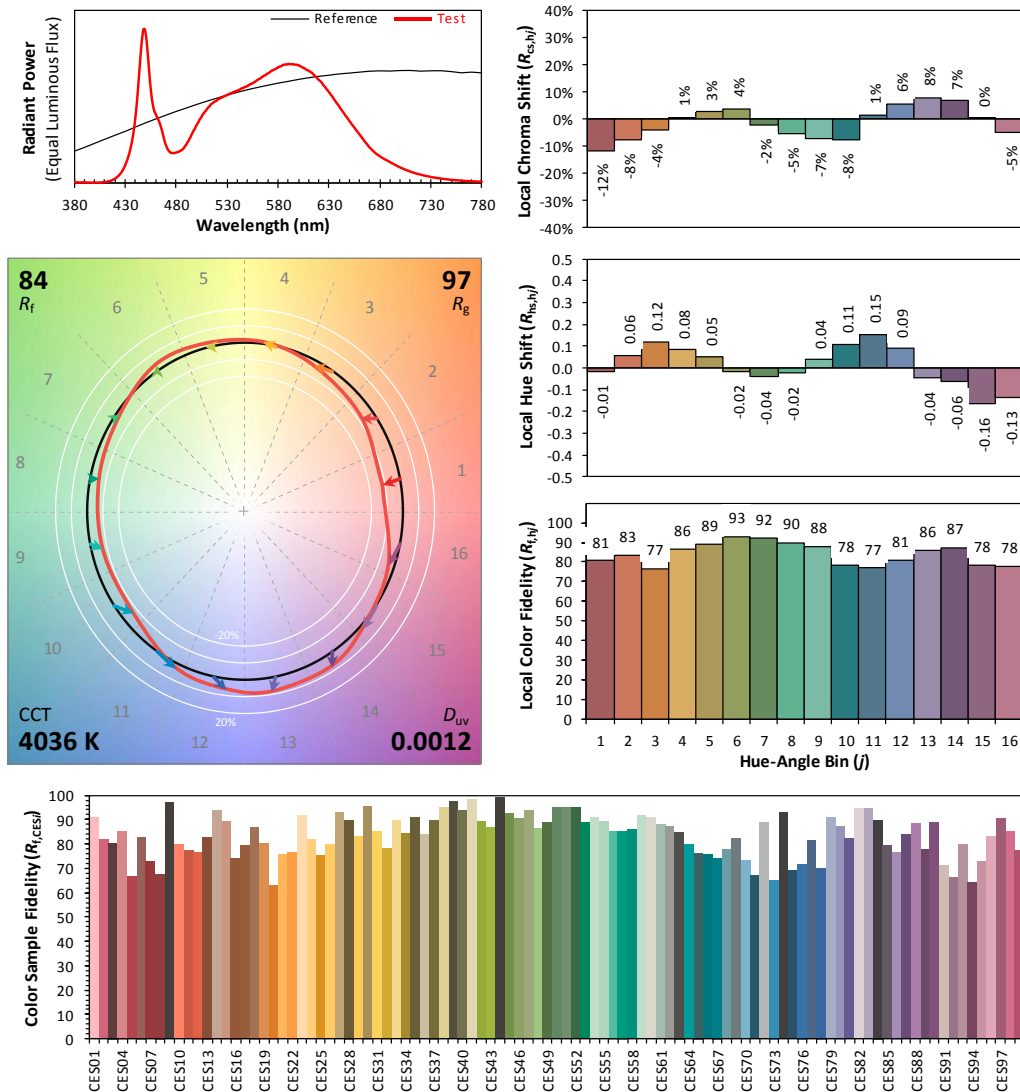
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/18

Model: ULB2-20L-U-40-L4



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

x 0.3797
 y 0.3788
 u' 0.2238
 v' 0.5024

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	213.62	4.21%
10- 20	608.386	11.99%
20- 30	900.489	17.74%
30- 40	1019.672	20.09%
40- 50	922.65	18.18%
50- 60	668.892	13.18%
60- 70	401.913	7.92%
70- 80	237.085	4.67%
80- 90	77.118	1.52%
90-100	1.507	0.03%
100-110	2.815	0.06%
110-120	4.073	0.08%
120-130	4.573	0.09%
130-140	4.09	0.08%
140-150	3.456	0.07%
150-160	2.508	0.05%
160-170	1.482	0.03%
170-180	0.469	0.01%
Total	5074.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	4333.709	85.40%
60- 90	716.116	14.11%
0-90	5049.825	99.51%
90- 180	24.973	0.49%
0- 180	5074.8	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

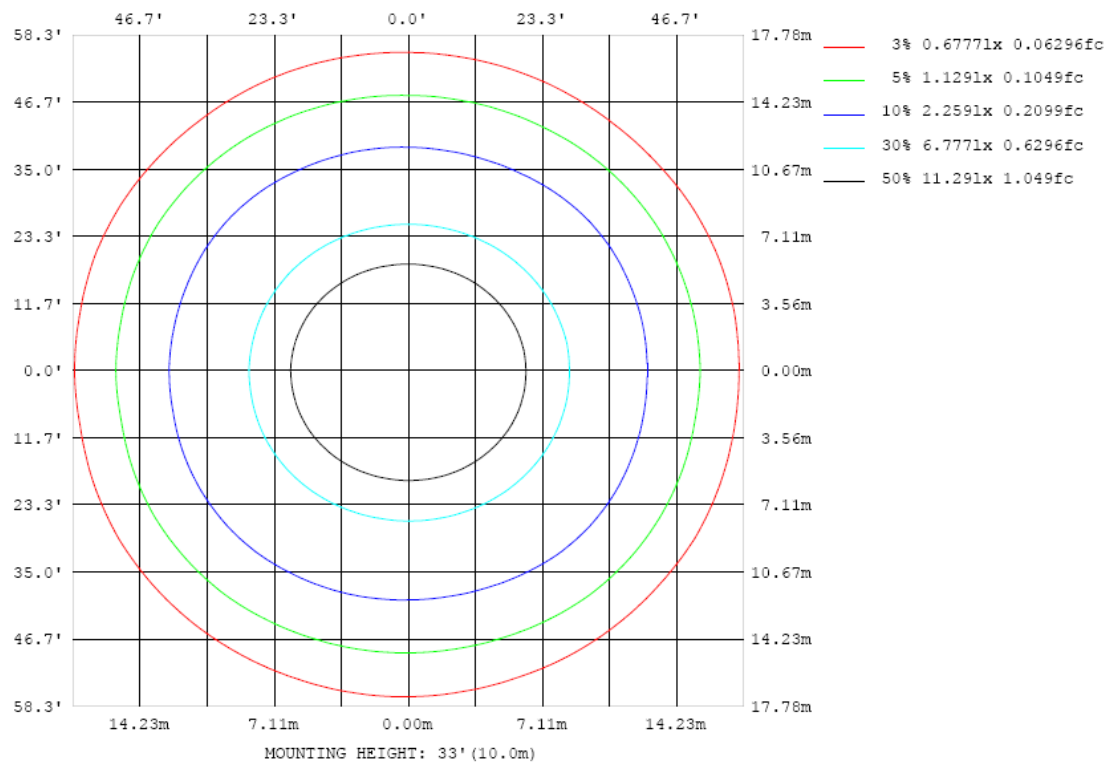


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

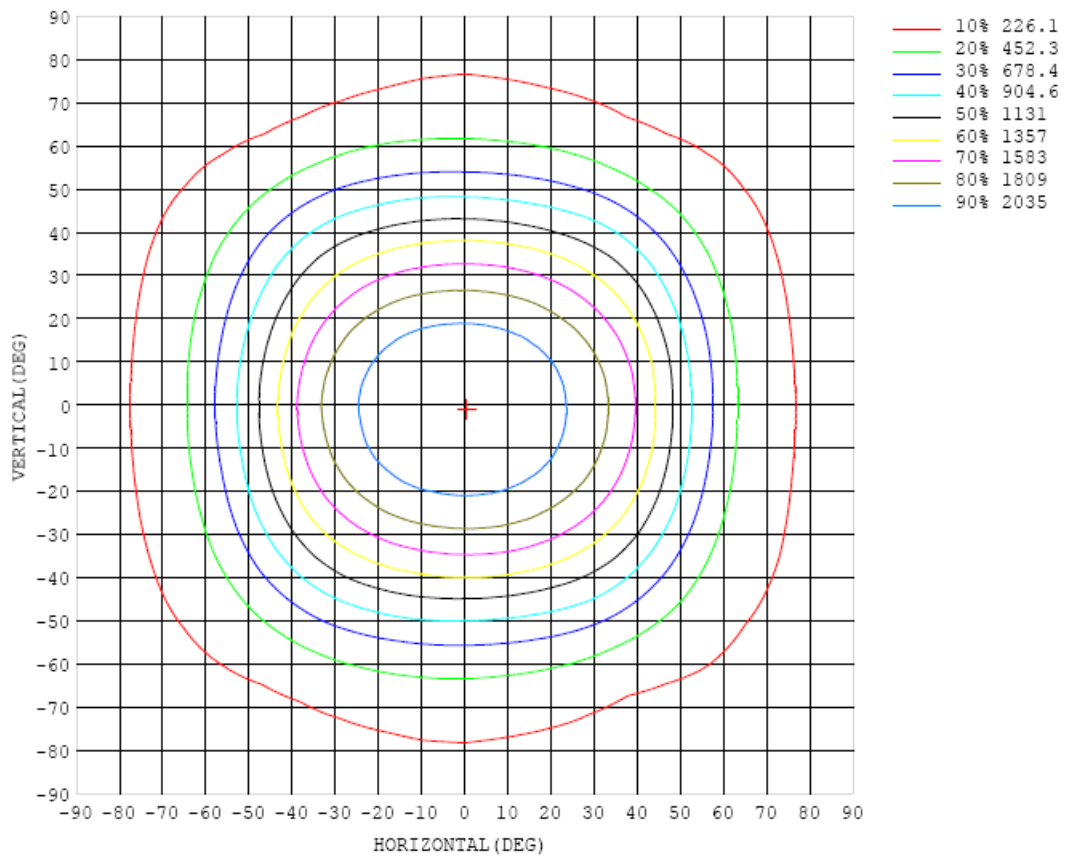


Chart 6: Isocandela Plot

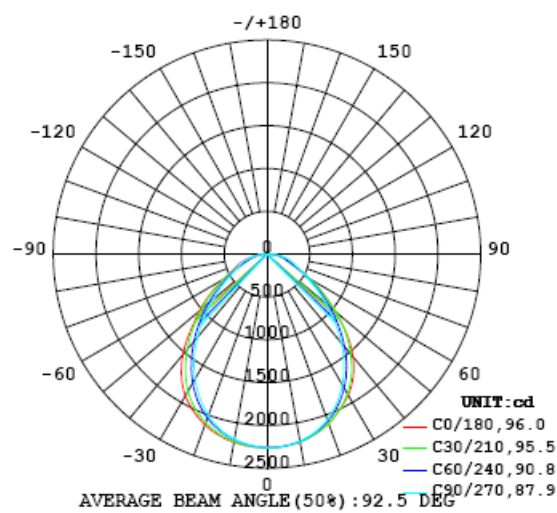


Chart 7: Polar Candela Distribution

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	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259
5	2249	2250	2253	2256	2255	2248	2251	2246	2257	2252	2253	2251	2247	2247	2263	2257	2251	2251	2255
10	2223	2223	2222	2221	2228	2223	2218	2215	2220	2220	2222	2223	2226	2220	2228	2227	2229	2228	2228
15	2171	2174	2178	2180	2172	2164	2164	2158	2159	2154	2157	2158	2163	2169	2185	2186	2183	2185	2189
20	2103	2106	2103	2103	2099	2086	2074	2061	2064	2059	2060	2067	2077	2086	2104	2111	2115	2117	2118
25	2007	2011	2011	2004	1990	1970	1954	1939	1932	1925	1931	1943	1959	1975	2002	2014	2020	2024	2028
30	1900	1902	1896	1881	1856	1830	1808	1783	1770	1761	1764	1778	1799	1825	1857	1879	1894	1904	1911
35	1758	1757	1747	1722	1692	1652	1619	1593	1579	1569	1572	1588	1613	1638	1679	1706	1724	1735	1743
40	1563	1565	1550	1523	1488	1450	1413	1381	1364	1353	1360	1377	1403	1433	1476	1501	1517	1525	1531
45	1322	1327	1320	1300	1267	1225	1184	1148	1131	1125	1135	1159	1187	1224	1259	1273	1272	1267	1268
50	1033	1043	1053	1053	1039	1006	958	921	907	902	919	940	966	999	1029	1037	1036	1027	1028
55	797	801	806	804	791	771	742	717	706	705	712	726	747	777	800	810	808	802	810
60	569	571	577	579	566	555	546	535	535	538	542	548	559	574	590	598	593	583	589
65	409	409	404	398	387	380	390	403	413	421	423	420	413	408	410	418	427	434	438
70	324	316	296	280	264	258	279	309	331	343	342	331	303	279	274	287	309	336	350
75	253	243	220	216	209	203	216	238	262	278	272	250	224	208	206	213	224	248	275
80	169	169	153	151	158	152	159	166	179	194	188	164	152	143	139	148	148	164	174
85	76.4	85.0	81.7	73.4	76.1	69.8	81.4	87.7	94.9	89.0	93.2	82.2	71.9	63.8	62.6	65.4	66.7	71.7	71.2
90	1.46	3.52	4.70	4.90	3.40	4.83	5.48	4.76	4.55	2.47	3.60	6.61	5.95	5.75	3.86	2.71	1.24	2.48	0.23
95	0.36	0.41	0.56	0.76	1.03	1.12	1.34	1.57	1.79	1.41	1.82	1.78	1.77	1.49	1.28	0.96	0.56	0.40	0.44
100	1.31	1.45	1.55	1.85	1.98	1.94	1.98	2.56	2.34	1.71	2.33	2.77	2.45	2.34	2.21	1.82	1.44	1.30	1.25
105	1.18	1.47	1.52	2.00	2.45	2.85	3.45	3.37	2.84	2.25	3.12	3.56	3.81	3.11	2.89	2.37	1.82	1.79	1.85
110	1.70	2.20	2.25	2.47	3.19	3.89	4.13	3.62	3.46	2.85	3.81	3.91	5.24	4.05	3.44	3.13	2.51	2.38	1.96
115	1.66	2.44	2.70	3.35	4.42	4.64	4.25	4.14	4.33	3.79	4.63	4.68	5.75	6.60	5.97	4.10	4.29	3.94	3.30
120	3.61	3.17	4.05	4.74	4.55	4.63	4.69	4.60	4.64	4.48	5.17	5.05	5.93	6.65	7.15	6.96	5.92	5.41	2.93
125	4.10	3.84	4.76	4.09	4.64	4.52	5.00	5.23	4.84	5.01	5.69	5.54	5.84	6.21	7.03	7.20	7.60	7.12	6.68
130	4.87	3.34	4.69	4.58	5.00	4.78	5.07	5.03	4.68	5.14	5.38	5.21	5.50	6.37	6.66	6.49	7.28	6.35	6.53
135	5.00	3.70	5.24	5.21	4.51	5.24	5.25	5.20	5.21	5.55	5.99	5.73	5.45	6.07	6.13	7.02	7.30	4.96	7.26
140	4.83	4.10	5.30	5.42	5.17	4.81	5.33	5.29	5.40	5.76	6.06	5.99	5.42	5.53	6.39	6.90	7.17	3.43	6.99
145	5.35	5.08	4.80	5.33	5.27	5.63	5.09	4.77	4.94	5.40	5.84	5.97	5.63	5.64	6.41	6.52	6.71	3.98	6.86
150	4.88	4.75	3.32	5.67	5.78	5.47	5.18	5.14	5.34	5.60	6.22	6.36	6.23	5.92	5.40	6.31	5.42	4.46	6.27
155	5.84	6.22	4.33	4.76	5.42	5.54	5.22	5.42	5.65	5.75	5.89	6.35	6.06	5.97	6.07	5.68	3.82	4.96	6.18
160	5.59	5.84	4.78	3.98	4.56	5.19	5.48	5.62	5.72	5.74	5.60	6.27	6.60	6.58	6.13	4.75	4.34	5.42	4.99
165	5.19	5.45	5.17	4.32	3.88	4.29	4.54	5.02	5.13	5.33	5.41	5.66	5.65	5.42	4.50	4.45	4.97	6.23	6.08
170	4.92	5.17	5.26	5.00	4.41	4.11	3.89	3.96	4.29	4.05	3.95	3.93	3.89	4.36	4.73	5.35	6.18	6.31	6.17
175	4.46	4.75	4.97	4.75	4.56	4.63	4.71	4.64	4.25	4.36	4.46	4.64	4.81	5.23	5.69	5.62	5.59	5.57	5.44
180	5.04	5.06	4.97	5.10	5.23	4.85	4.76	5.24	4.91	5.76	5.14	5.73	5.23	4.78	4.29	4.46	4.83	4.48	4.82

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		2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	2259	
5		2251	2249	2251	2253	2240	2241	2235	2244	2240	2243	2242	2240	2235	2253	2248	2246	2251	
10		2227	2223	2220	2211	2208	2202	2194	2198	2194	2196	2195	2195	2201	2207	2214	2214	2217	
15		2182	2173	2167	2162	2142	2132	2125	2120	2119	2120	2125	2131	2132	2152	2154	2164	2169	
20		2115	2106	2095	2076	2057	2037	2014	2014	2005	2009	2014	2025	2037	2061	2078	2086	2097	
25		2021	2005	1987	1964	1930	1903	1881	1865	1859	1860	1873	1892	1920	1949	1970	1989	2001	
30		1899	1878	1850	1815	1772	1740	1708	1691	1681	1688	1706	1730	1758	1802	1838	1868	1891	
35		1726	1699	1663	1622	1582	1543	1512	1494	1485	1494	1512	1541	1580	1628	1675	1712	1748	
40		1511	1486	1452	1419	1370	1333	1297	1277	1267	1271	1292	1327	1373	1426	1470	1514	1557	
45		1253	1242	1224	1202	1161	1111	1078	1056	1041	1044	1060	1095	1144	1206	1250	1286	1320	
50		1018	1006	995	976	937	895	863	844	828	826	841	872	920	973	1004	1021	1037	
55		800	791	782	758	728	693	669	652	640	641	651	669	701	736	762	779	795	
60		586	590	577	556	533	520	507	498	491	489	491	495	501	521	547	563	572	
65		440	423	396	376	368	375	386	391	391	383	372	359	348	354	372	394	411	
70		343	302	269	250	251	271	298	317	323	310	291	268	247	247	262	285	315	
75		250	216	196	190	191	194	211	240	253	237	217	204	195	200	204	213	235	
80		164	142	133	121	118	125	132	155	159	156	144	144	137	145	145	146	165	
85		72.6	61.1	51.9	48.9	43.0	48.1	52.6	61.9	57.3	64.0	64.0	61.8	56.3	63.6	65.4	75.6	87.1	
90		0.22	0.42	0.72	1.02	1.58	2.15	2.23	1.31	1.12	2.10	3.40	3.63	2.97	2.17	1.44	0.60	1.07	
95		0.46	0.71	0.94	1.13	1.40	1.55	1.66	1.80	1.29	1.85	1.61	1.29	1.11	1.11	0.92	0.63	0.46	
100		1.40	1.64	2.07	2.46	2.68	2.59	2.96	2.52	1.80	2.52	2.92	2.43	2.12	1.95	1.99	1.22	1.44	
105		1.97	1.98	2.43	2.92	3.23	3.86	3.58	3.18	2.31	3.12	3.30	3.72	3.07	2.96	2.44	1.50	1.49	
110		2.44	2.56	3.00	3.75	4.48	4.81	3.93	3.76	2.95	3.54	3.61	4.32	4.17	3.33	2.56	2.17	2.30	
115		3.60	4.04	4.36	5.18	5.73	5.07	4.36	4.08	3.38	3.83	4.04	4.34	4.86	4.41	3.42	2.63	2.31	
120		2.92	5.52	3.69	6.21	5.86	5.14	4.80	4.33	3.93	4.24	4.35	4.58	4.59	4.59	4.41	4.45	3.49	
125		6.43	7.33	6.49	4.44	5.42	5.05	4.80	4.28	4.40	4.28	4.47	4.55	4.42	4.64	4.65	4.16	3.59	
130		5.63	6.86	6.88	4.47	4.51	5.12	4.50	4.17	4.47	4.24	4.28	4.56	4.52	4.32	4.50	5.07	4.10	
135		6.63	4.96	6.81	5.95	5.65	4.47	4.47	4.98	5.05	4.97	4.51	4.58	4.80	4.35	4.84	4.80	4.03	
140		6.58	6.61	6.71	6.49	5.29	5.03	5.25	4.79	4.90	4.75	4.96	5.24	4.70	5.50	5.58	5.05	4.32	
145		6.76	5.79	5.12	6.06	5.87	5.43	5.24	5.52	4.71	5.25	4.99	5.00	5.38	5.41	4.53	5.50	5.65	
150		6.43	5.37	6.21	4.88	5.40	5.85	6.11	6.21	4.93	5.00	5.24	5.32	5.50	5.17	5.17	4.78	4.85	
155		6.52	5.87	4.85	5.81	4.81	5.19	6.32	6.17	5.05	5.73	5.18	4.83	4.84	5.08	5.23	5.16	6.21	
160		5.28	5.66	5.25	5.34	6.31	6.21	5.23	5.07	4.99	5.22	5.17	5.21	5.08	4.51	4.35	5.66	6.17	
165		6.00	6.29	6.17	6.09	5.59	5.62	5.49	5.30	5.00	4.96	5.29	4.52	4.11	4.10	4.85	5.36	5.40	
170		6.10	6.11	6.25	6.37	6.11	5.86	5.35	4.90	4.24	4.11	4.27	4.23	4.18	4.32	4.35	4.60	4.79	
175		5.47	5.44	5.50	5.42	5.32	5.28	4.99	4.67	4.47	4.55	4.41	4.65	4.68	4.54	4.54	4.62	4.96	
180		4.81	4.97	4.97	5.07	5.12	5.07	5.02	4.76	5.22	5.36	5.32	4.85	5.01	5.00	5.09	5.03	4.99	

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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