

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-50-L4

ULB2-20L-U-50-L4-MWS

20LB/2F/850/U/A4

20LB/2F/850/U/A4/MWS

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,
Hangzhou, Zhejiang Province, China 311100

Tel: +86571 86376106

www.ltlqa.com

Report No.: HZ25030014i

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Review by:

Wei Fei

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: **ULB2-20L-U-50-L4**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
126.7	5018.5	39.61	0.9958
CCT (K)	CRI	Stabilization Time (Light & Power)	
5230	83.3	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. 19, 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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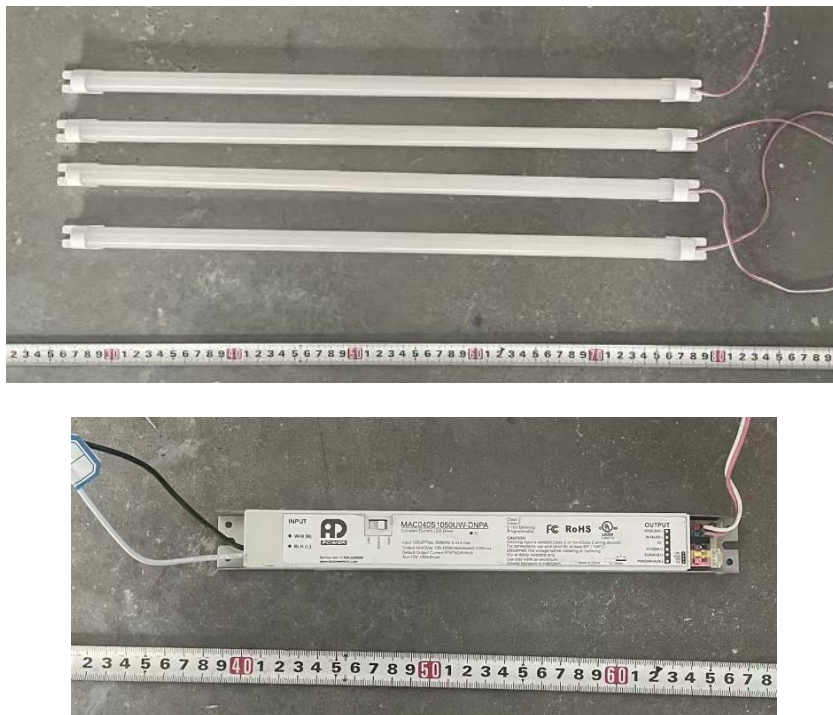
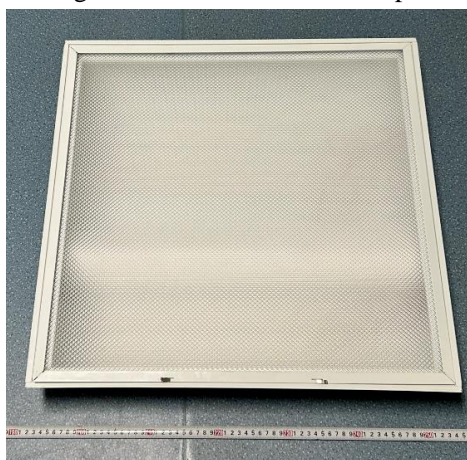


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x2

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB2-20L-U-50-L4	ULB2-20L-U-50-L4-MWS
	20LB/2F/850/U/A4	20LB/2F/850/U/A4/MWS
Electrical Ratings	: 120-277V, 50/60Hz	
Product Description	: Field-Adjustable 40W/36W/32W, 5000K 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	0.9958	0.9616
Test Power (W)	39.61	39.37
THD A%	6.94	14.81
Luminous Efficacy (lm/W)	126.7	127.9
Total Luminous Flux (lm)	5018.5	5037.3
Color Rendering Index (CRI)	83.3	
R9	14	
Correlated Color Temperature (CCT)(K)	5230	
Chromaticity Chroma x	0.3389	
Chromaticity Chroma y	0.3470	
Chromaticity Chroma u	0.2090	
Chromaticity Chroma v	0.3210	
Duv	0.0003	
Chromaticity Chroma u'	0.2090	
Chromaticity Chroma v'	0.4815	

Special Color Rendering Indices	
R1	82.5
R2	87.2
R3	89.9
R4	84.3
R5	83.1
R6	81.8
R7	87
R8	70.3
R9	14
R10	69.3
R11	84.1
R12	60.5
R13	83.6
R14	94.5

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)	39.62
Luminous Efficacy (lm/W)	126.9
Total Luminous Flux (lm)	5029.5
Beam Angle (°)	96.9 (0°-180°) / 88.0 (90°-270°)
Center Beam Candle Power (cd)	2224
Maximum Beam Candle Power (cd)	2229 (At: C=50.0, Gamma=0.5)
Spacing Criteria	1.27 (0°-180°) / 1.13 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	85.29%
Zonal Lumens in the 60 °-90 °Zone	14.21%
Zonal Lumens in the 90 °-120 °Zone	0.17%
Zonal Lumens in the 120 °-180 °Zone	0.32%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

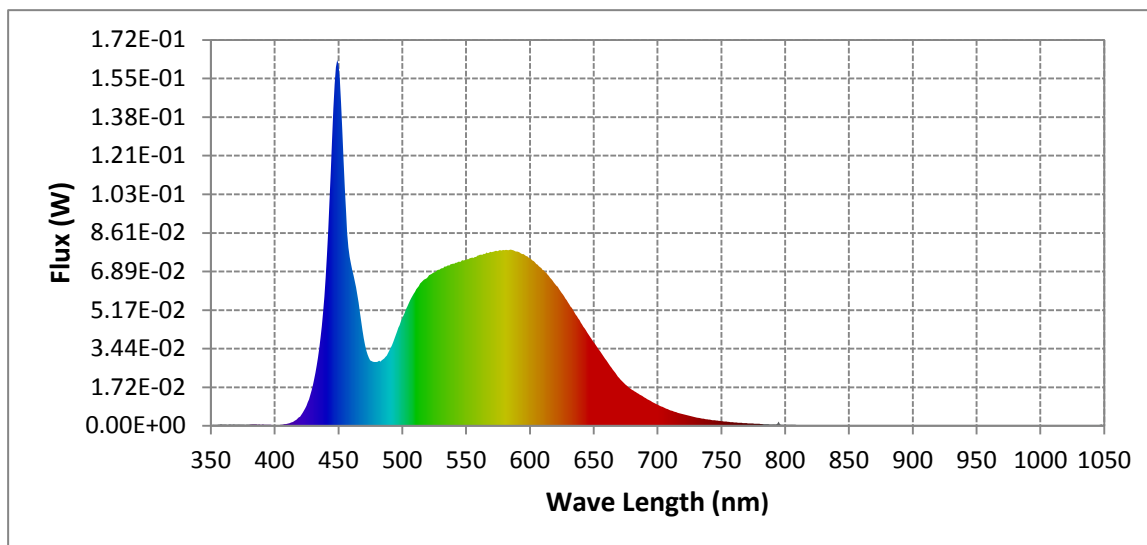
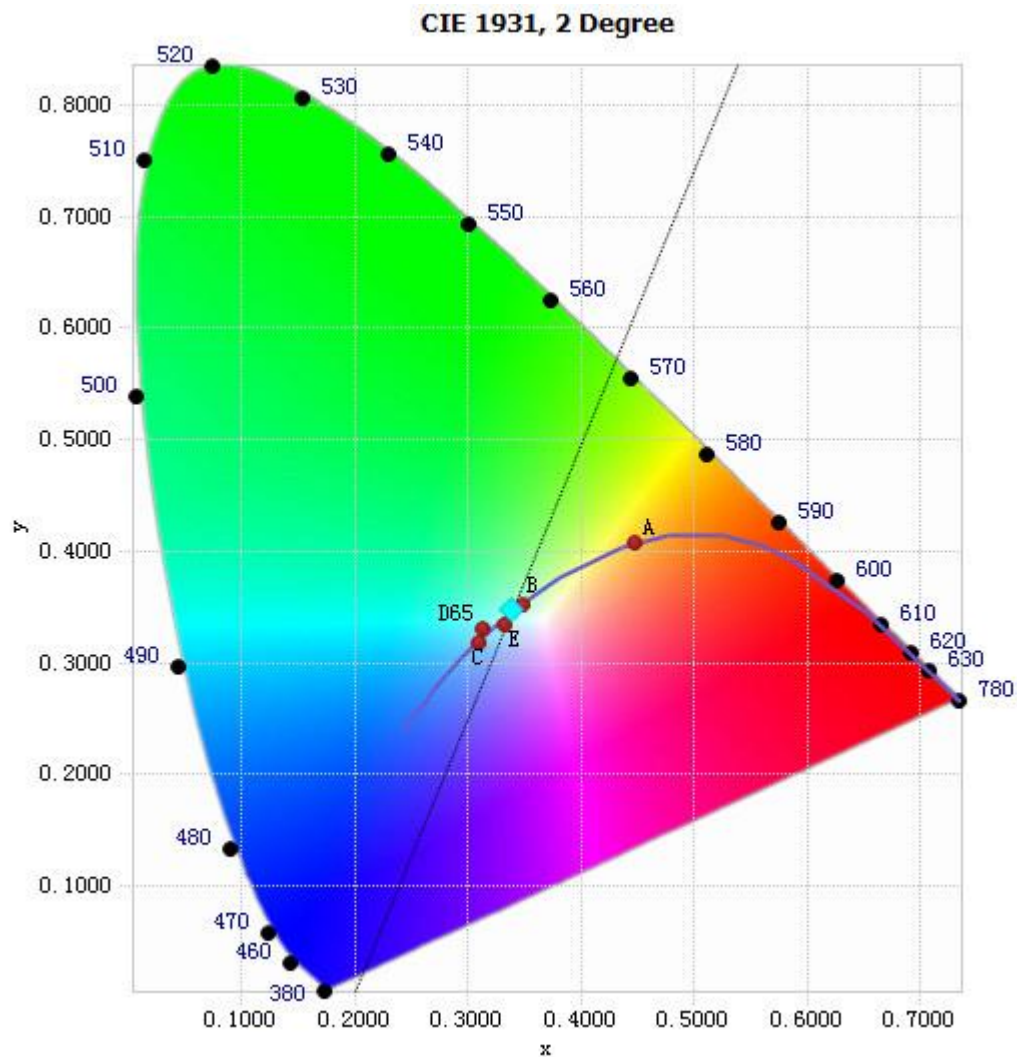


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	6.08E-04	485	2.96E-02	590	7.78E-02	695	1.10E-02
385	5.89E-04	490	3.36E-02	595	7.67E-02	700	9.48E-03
390	4.68E-04	495	4.05E-02	600	7.48E-02	705	8.16E-03
395	4.53E-04	500	4.79E-02	605	7.22E-02	710	6.99E-03
400	3.13E-04	505	5.44E-02	610	6.95E-02	715	6.03E-03
405	4.68E-04	510	5.98E-02	615	6.69E-02	720	5.19E-03
410	9.26E-04	515	6.41E-02	620	6.32E-02	725	4.47E-03
415	1.95E-03	520	6.63E-02	625	5.93E-02	730	3.82E-03
420	4.13E-03	525	6.85E-02	630	5.50E-02	735	3.26E-03
425	8.99E-03	530	7.00E-02	635	5.06E-02	740	2.81E-03
430	1.81E-02	535	7.11E-02	640	4.61E-02	745	2.44E-03
435	3.46E-02	540	7.23E-02	645	4.17E-02	750	2.07E-03
440	6.61E-02	545	7.32E-02	650	3.73E-02	755	1.79E-03
445	1.28E-01	550	7.41E-02	655	3.33E-02	760	1.54E-03
450	1.61E-01	555	7.50E-02	660	2.92E-02	765	1.32E-03
455	1.06E-01	560	7.60E-02	665	2.51E-02	770	1.16E-03
460	7.23E-02	565	7.66E-02	670	2.13E-02	775	1.01E-03
465	5.83E-02	570	7.75E-02	675	1.84E-02	780	8.83E-04
470	3.90E-02	575	7.79E-02	680	1.61E-02		
475	2.92E-02	580	7.83E-02	685	1.43E-02		
480	2.85E-02	585	7.87E-02	690	1.27E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3389, 0.3470)

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

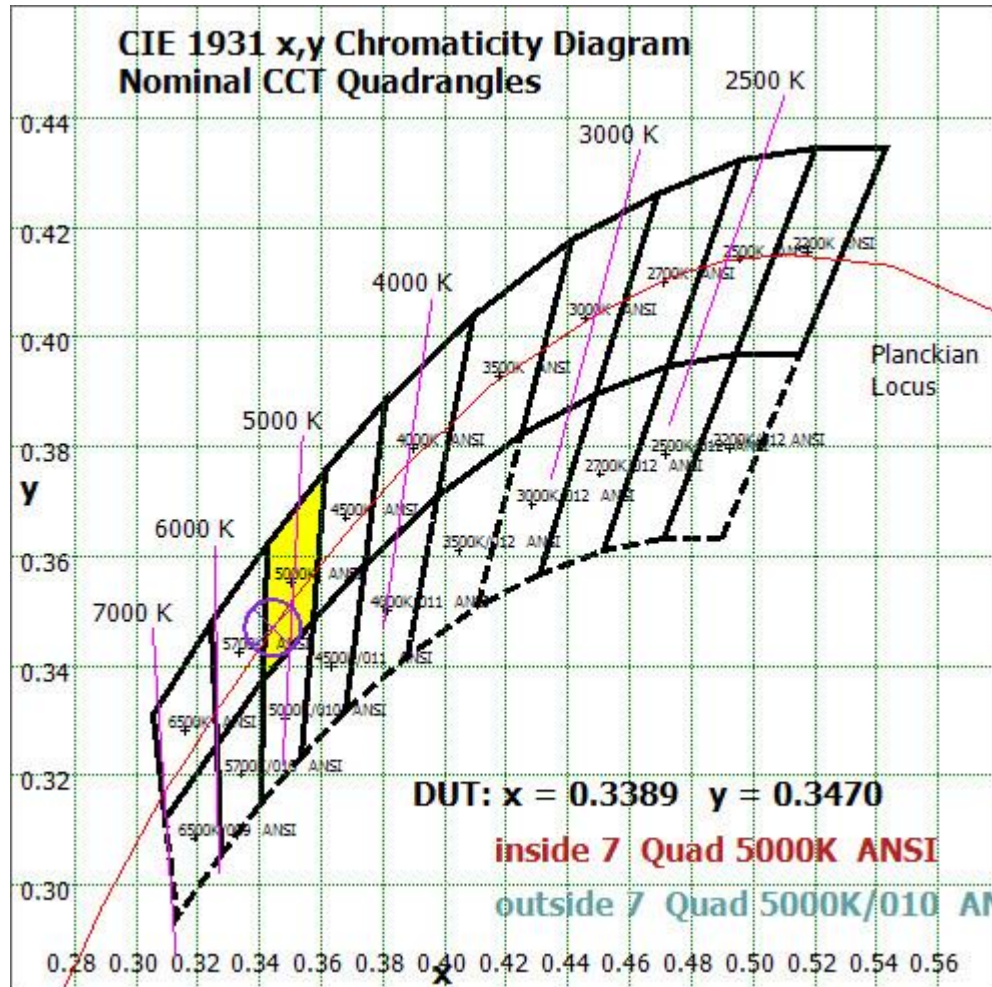


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram



Quality Assured
Color Rendition Report – Sphere Spectroradiometer Method

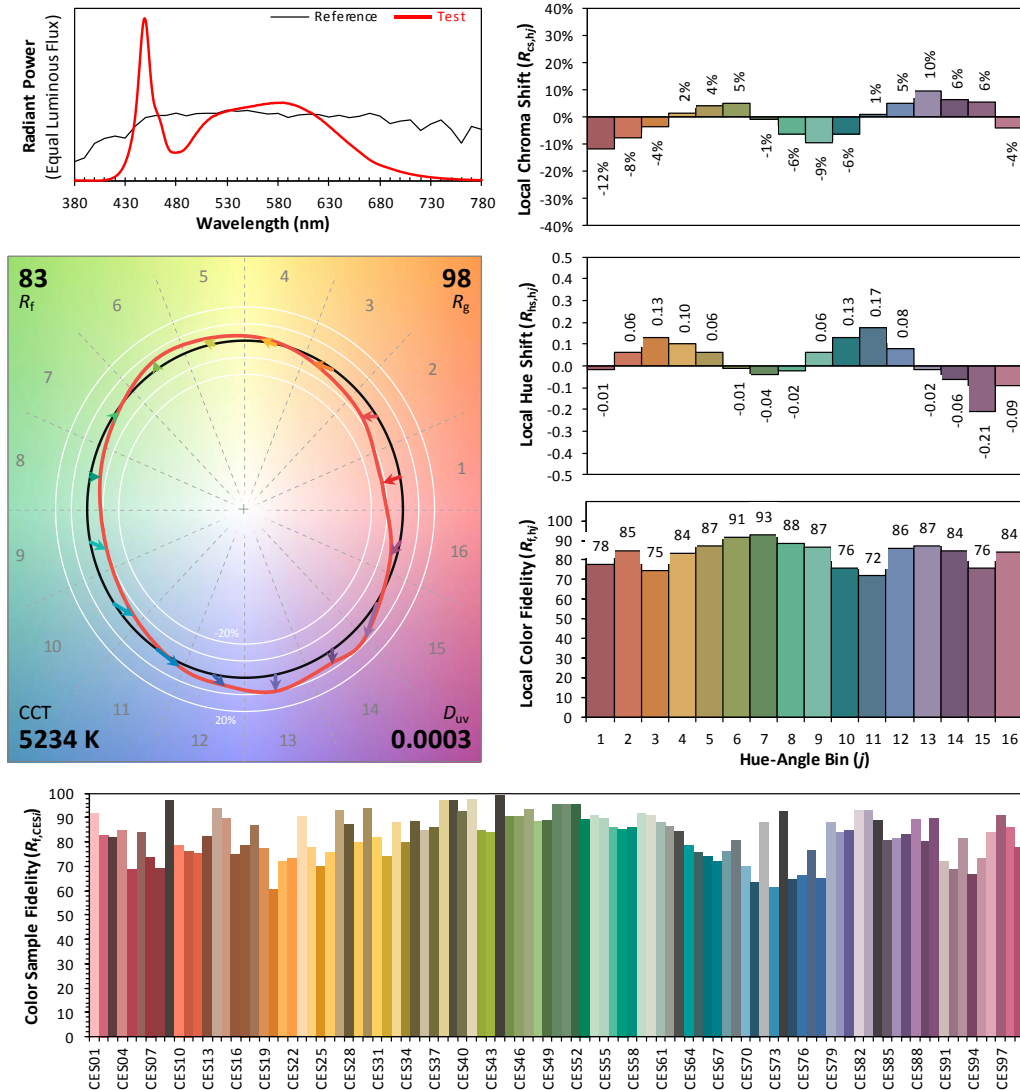
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/19

Model: ULB2-20L-U-50-L4



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

x 0.3389
 y 0.3470
 u' 0.2090
 v' 0.4815

CIE 13.3-1995
(CRI)

R_a 83
 R_g 14

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	210.334	4.18%
10- 20	599.179	11.91%
20- 30	887.832	17.65%
30- 40	1008.064	20.04%
40- 50	917.059	18.23%
50- 60	667.281	13.27%
60- 70	401.36	7.98%
70- 80	236.467	4.70%
80- 90	77.009	1.53%
90-100	1.477	0.03%
100-110	2.935	0.06%
110-120	4.175	0.08%
120-130	4.545	0.09%
130-140	4.024	0.08%
140-150	3.373	0.07%
150-160	2.48	0.05%
160-170	1.454	0.03%
170-180	0.453	0.01%
Total	5029.5	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	4289.749	85.29%
60- 90	714.836	14.21%
0-90	5004.585	99.50%
90- 180	24.916	0.50%
0- 180	5029.5	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

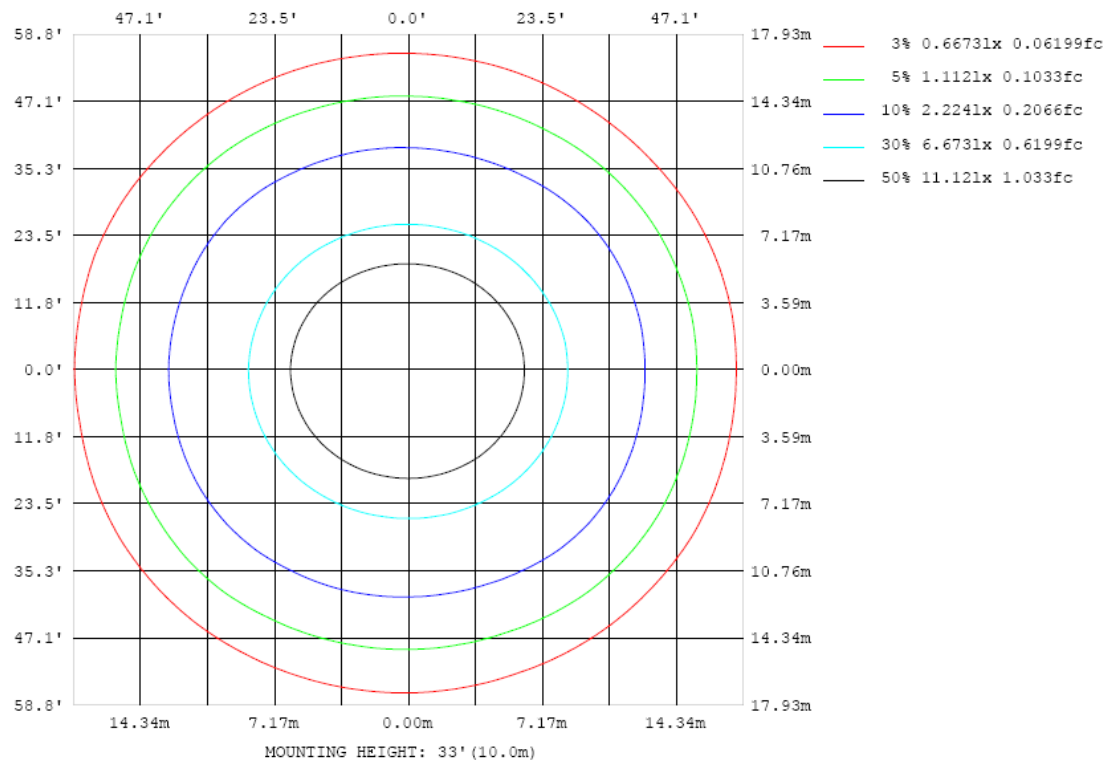


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

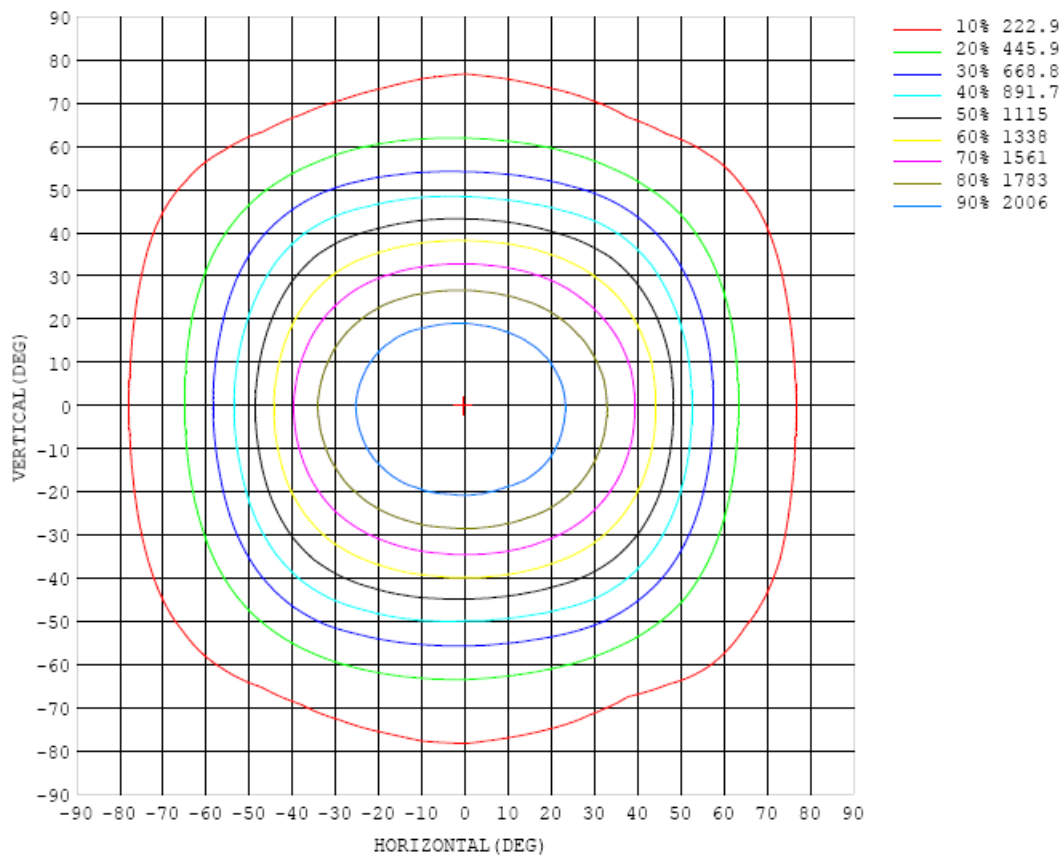


Chart 6: Isocandela Plot

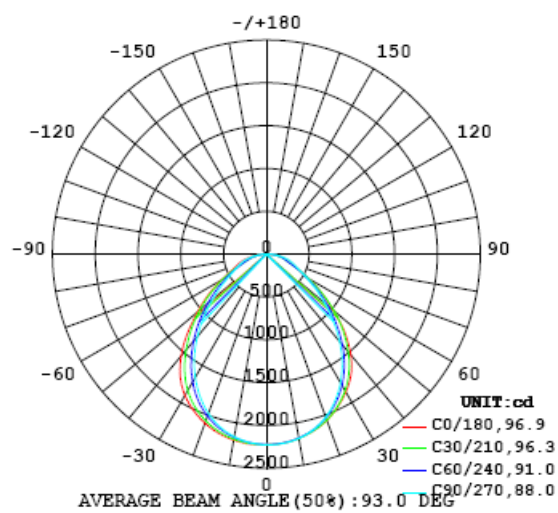


Chart 7: Polar Candela Distribution

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	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224
5	2216	2211	2214	2216	2220	2217	2212	2210	2218	2219	2216	2218	2217	2218	2217	2220	2218	2222	2225
10	2183	2180	2181	2187	2184	2190	2179	2184	2182	2185	2184	2189	2185	2193	2194	2194	2199	2202	2204
15	2132	2136	2134	2132	2131	2126	2126	2117	2120	2120	2123	2127	2135	2143	2149	2157	2158	2160	2162
20	2066	2063	2063	2062	2059	2047	2031	2026	2026	2027	2024	2038	2045	2061	2075	2084	2091	2097	2103
25	1970	1972	1968	1966	1952	1942	1916	1905	1896	1892	1899	1914	1929	1953	1970	1989	2000	2010	2015
30	1857	1859	1853	1838	1819	1794	1770	1746	1734	1731	1736	1754	1778	1807	1838	1866	1885	1897	1903
35	1722	1719	1707	1681	1655	1622	1587	1565	1551	1543	1547	1568	1594	1625	1666	1696	1726	1746	1757
40	1535	1534	1517	1491	1456	1420	1382	1357	1338	1330	1337	1359	1387	1429	1463	1501	1525	1543	1550
45	1297	1301	1293	1272	1240	1204	1160	1126	1109	1106	1120	1148	1178	1218	1260	1288	1305	1301	1303
50	1019	1028	1037	1035	1020	985	936	905	891	888	906	932	959	1004	1039	1055	1057	1051	1052
55	784	787	792	792	782	760	728	704	695	700	704	722	743	783	808	823	823	819	828
60	561	563	569	570	557	548	537	526	526	531	536	545	561	580	596	607	605	595	602
65	405	403	399	394	383	376	384	397	408	416	418	418	414	413	415	423	434	441	446
70	320	313	293	277	261	256	275	305	327	339	339	330	304	281	275	289	312	341	356
75	249	241	218	213	206	201	213	235	258	274	270	250	224	209	206	215	227	252	279
80	167	168	152	149	157	150	157	164	177	192	187	162	152	145	140	149	151	168	178
85	76.1	84.2	81.7	73.1	75.9	69.4	80.3	86.4	93.7	88.1	92.1	84.6	73.8	64.1	63.0	66.7	67.4	72.9	72.0
90	1.48	3.63	4.73	4.90	3.73	4.54	5.59	4.66	4.50	2.46	3.81	3.91	5.27	5.02	3.25	2.52	1.22	2.38	0.22
95	0.32	0.32	0.50	0.74	1.00	1.15	1.35	1.58	1.80	1.52	1.89	1.78	1.75	1.41	1.34	1.05	0.64	0.39	0.44
100	0.98	1.19	1.25	1.55	1.86	2.06	2.15	2.54	2.44	1.75	2.37	2.86	2.53	2.50	2.36	2.00	1.59	1.43	1.37
105	1.53	1.47	1.33	2.00	2.49	3.05	3.55	3.41	2.96	2.34	3.30	3.86	4.26	3.85	3.33	2.54	2.11	2.12	2.05
110	1.63	2.20	2.26	2.46	3.15	3.82	3.72	3.70	3.73	3.17	4.18	4.47	5.52	5.29	4.54	3.46	2.75	2.48	1.98
115	1.46	2.32	2.54	3.33	4.32	4.35	4.36	4.15	4.39	3.87	4.83	4.99	5.96	6.69	6.21	5.07	4.55	4.10	3.47
120	3.74	3.17	4.21	4.47	4.49	4.47	4.56	4.43	4.71	4.48	5.29	5.41	6.05	6.74	6.93	7.06	6.24	5.62	3.01
125	3.58	3.33	4.46	4.25	4.52	4.28	4.55	5.00	4.91	4.94	5.69	5.82	6.04	6.31	7.02	6.96	7.51	7.08	6.81
130	4.72	3.19	4.42	4.28	4.79	4.51	4.76	4.76	4.58	5.11	5.64	5.60	5.87	6.68	6.77	6.56	7.33	6.33	6.54
135	4.42	3.37	4.93	4.95	4.03	4.94	5.19	5.12	5.04	5.41	6.15	6.07	5.97	6.36	6.33	7.16	7.48	4.92	7.35
140	4.44	3.88	4.58	4.83	4.67	4.33	5.17	5.06	5.27	5.66	6.19	6.09	5.91	5.95	6.62	7.15	7.41	3.40	7.17
145	4.47	4.41	4.09	4.76	4.57	5.10	4.80	4.59	4.86	5.50	5.79	5.88	5.76	5.96	6.72	6.84	7.06	3.89	7.18
150	4.13	3.94	3.04	4.96	5.50	5.29	4.93	4.81	5.12	5.50	6.11	6.38	6.19	6.23	5.76	6.77	5.70	4.40	6.55
155	5.62	5.94	4.06	4.70	5.37	5.33	5.04	5.20	5.47	5.62	5.91	6.36	6.11	6.16	6.38	6.08	3.69	5.00	6.55
160	5.59	5.87	4.65	3.84	4.65	5.31	5.51	5.46	5.60	5.66	5.68	6.26	6.68	6.62	6.31	4.76	4.27	5.88	5.26
165	5.11	5.36	5.06	4.15	3.77	4.29	4.48	4.85	5.17	5.45	5.60	5.83	5.78	5.49	4.49	4.42	5.08	6.30	6.10
170	4.81	4.98	5.12	4.82	4.25	3.91	3.69	3.73	4.09	3.95	3.90	3.87	3.85	4.26	4.65	5.32	6.20	6.27	6.11
175	4.14	4.42	4.62	4.39	4.22	4.26	4.37	4.38	4.08	4.17	4.35	4.56	4.71	5.15	5.65	5.54	5.51	5.54	5.40
180	4.87	4.87	4.77	4.82	5.00	5.01	5.17	4.83	5.06	5.60	5.45	5.08	4.85	4.61	4.98	4.99	4.79	4.24	4.67

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	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224	2224		
5	2218	2219	2219	2218	2219	2208	2208	2208	2209	2206	2208	2201	2210	2209	2204	2206	2213		
10	2198	2196	2192	2190	2181	2171	2165	2168	2164	2161	2163	2162	2165	2165	2171	2177	2181		
15	2154	2149	2142	2132	2124	2110	2103	2091	2090	2086	2092	2093	2103	2107	2118	2124	2128		
20	2090	2083	2074	2058	2040	2013	1995	1987	1980	1978	1986	1990	2009	2026	2035	2047	2061		
25	2004	1990	1972	1947	1919	1886	1861	1845	1836	1833	1845	1865	1888	1910	1935	1952	1966		
30	1891	1868	1838	1802	1763	1728	1695	1671	1663	1666	1683	1705	1740	1765	1804	1831	1851		
35	1734	1705	1669	1624	1579	1533	1503	1481	1471	1473	1491	1520	1557	1598	1637	1677	1714		
40	1528	1498	1461	1421	1376	1324	1289	1268	1255	1257	1279	1308	1351	1398	1444	1492	1525		
45	1287	1270	1243	1212	1164	1110	1075	1048	1032	1031	1047	1078	1131	1181	1226	1263	1294		
50	1040	1026	1017	993	949	895	861	839	823	818	832	860	907	958	988	1006	1023		
55	818	807	797	772	740	698	667	648	636	635	644	661	694	724	751	767	781		
60	598	601	588	565	543	524	510	495	489	485	486	489	497	512	538	554	564		
65	447	431	404	383	374	378	386	389	389	380	369	356	345	349	366	388	406		
70	348	308	274	253	254	272	298	316	320	308	288	266	244	243	258	281	310		
75	255	220	199	192	193	194	211	237	252	235	215	202	194	197	201	210	231		
80	168	145	135	122	119	126	131	154	158	155	143	143	136	143	144	144	163		
85	73.2	62.1	52.7	50.0	43.9	47.9	51.8	60.9	56.6	63.3	63.0	62.8	56.1	62.2	64.9	74.5	86.2		
90	0.21	0.41	0.69	1.02	1.44	2.02	2.01	1.44	1.11	2.21	3.01	3.61	2.96	2.21	1.43	0.96	1.01		
95	0.46	0.71	0.94	1.13	1.42	1.56	1.69	1.80	1.12	1.67	1.53	1.29	1.08	1.09	0.87	0.62	0.42		
100	1.58	1.72	2.10	2.60	2.90	2.72	2.93	2.50	1.67	2.34	2.81	2.35	2.22	2.03	1.87	1.02	1.22		
105	2.35	2.38	2.46	3.12	3.67	4.10	3.65	3.16	2.31	2.97	3.43	3.77	3.06	2.81	2.50	1.84	1.96		
110	2.48	2.82	3.36	4.17	4.96	4.80	4.12	3.81	3.02	3.39	3.66	4.10	4.11	3.46	2.66	2.15	2.19		
115	3.77	4.32	4.57	5.63	5.76	5.23	4.49	4.15	3.65	3.70	3.89	4.04	4.73	4.38	3.66	2.62	2.35		
120	3.05	5.96	3.78	6.15	6.00	5.33	4.85	4.54	4.24	4.09	4.05	4.30	4.44	4.59	4.29	4.43	3.59		
125	6.50	7.25	6.56	4.32	5.62	5.09	4.96	4.49	4.47	4.12	4.23	4.29	4.15	4.44	4.51	4.11	3.52		
130	5.79	7.02	6.90	4.41	4.28	5.24	4.76	4.36	4.45	4.10	4.07	4.26	4.25	4.13	4.26	4.62	3.87		
135	6.59	4.69	6.90	6.12	5.85	4.30	4.55	5.08	5.03	4.84	4.27	4.26	4.48	4.12	4.58	4.56	3.65		
140	6.68	6.84	6.87	6.62	5.52	5.46	5.17	4.68	4.74	4.58	4.73	4.96	4.36	4.79	4.84	4.76	3.94		
145	7.02	6.57	4.93	6.27	6.17	5.87	5.38	5.49	4.66	5.12	4.53	4.54	5.21	4.66	4.18	4.83	4.92		
150	6.69	5.63	6.54	4.72	5.65	6.33	6.15	6.07	4.83	4.76	4.67	5.00	5.32	4.89	4.68	4.12	4.31		
155	6.94	6.17	5.21	5.91	4.70	5.50	6.32	6.07	4.90	5.29	4.89	4.49	4.55	4.78	4.66	4.90	6.10		
160	5.58	5.78	5.23	5.36	6.34	6.16	5.07	4.83	4.82	5.00	4.91	4.95	4.81	4.27	4.02	5.42	6.07		
165	6.09	6.36	6.13	5.88	5.29	5.03	5.13	5.43	4.83	4.75	4.99	4.27	3.95	3.91	4.63	5.05	5.20		
170	6.05	5.94	6.16	6.15	5.84	5.49	4.96	4.49	4.02	3.99	4.10	4.03	3.97	4.00	4.08	4.27	4.46		
175	5.41	5.43	5.47	5.42	5.28	5.16	4.77	4.52	4.39	4.36	4.16	4.40	4.45	4.28	4.25	4.31	4.62		
180	4.65	4.82	4.80	4.87	4.97	4.90	4.89	4.67	5.03	5.16	5.12	4.67	4.81	4.77	4.85	4.81	4.76		

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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