

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-35-L4

ULB2-20L-U-35-L4-MWS

20LB/2F/835/U/A4

20LB/2F/835/U/A4/MWS

Laboratory: Leading Testing Laboratories

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Report No.: HZ25030014c

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

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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-35-L4**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
126.3	5001.9	39.60	0.9961
CCT (K)	CRI	Stabilization Time (Light & Power)	
3538	82.3	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. 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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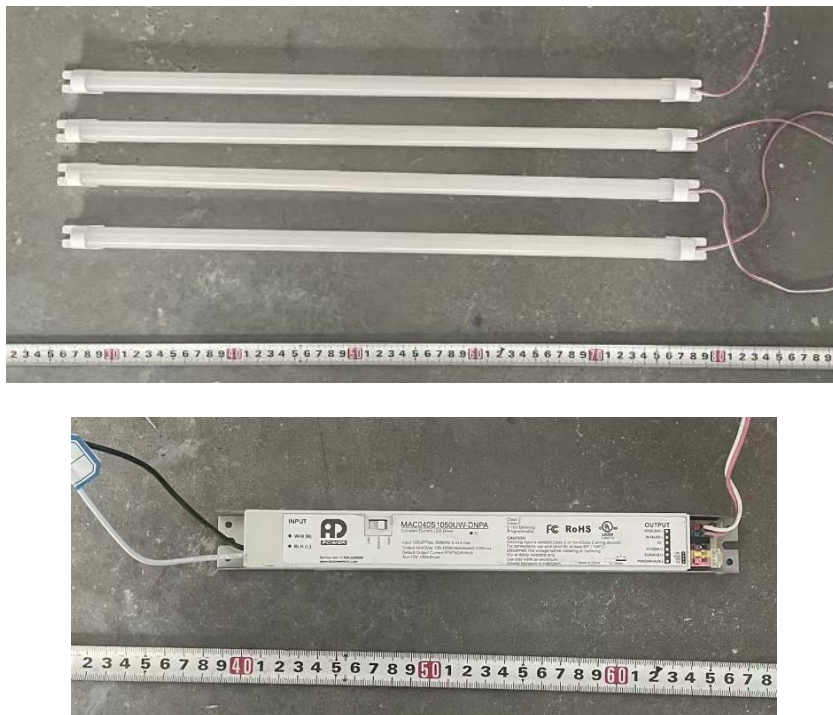
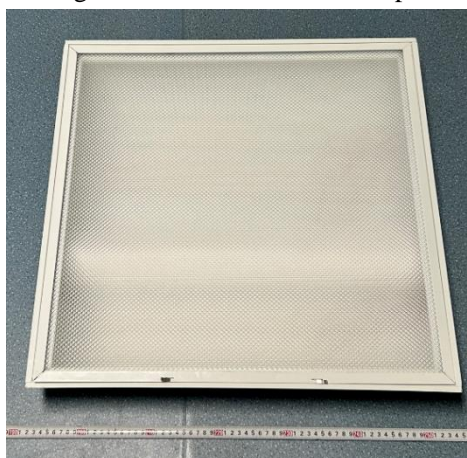


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x2

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB2-20L-U-35-L4	ULB2-20L-U-35-L4-MWS
	20LB/2F/835/U/A4	20LB/2F/835/U/A4/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)	0.331	0.148
Power Factor	0.9961	0.9617
Test Power (W)	39.60	39.37
THD A%	6.82	14.88
Luminous Efficacy (lm/W)	126.3	127.6
Total Luminous Flux (lm)	5001.9	5022.8
Color Rendering Index (CRI)	82.3	
R9	8.5	
Correlated Color Temperature (CCT)(K)	3538	
Chromaticity Chroma x	0.4031	
Chromaticity Chroma y	0.3896	
Chromaticity Chroma u	0.2347	
Chromaticity Chroma v	0.3403	
Duv	0	
Chromaticity Chroma u'	0.2347	
Chromaticity Chroma v'	0.5105	

Special Color Rendering Indices	
R1	80.7
R2	88.3
R3	94.5
R4	81.7
R5	80.6
R6	84.3
R7	85.3
R8	63.2
R9	8.5
R10	72.7
R11	80.9
R12	62.8
R13	82.3
R14	96.9

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)	126.5
Total Luminous Flux (lm)	5014.3
Beam Angle (°)	96.2 (0°-180°) / 87.9 (90°-270°)
Center Beam Candle Power (cd)	2229
Maximum Beam Candle Power (cd)	2236 (At: C=40.0, Gamma=0.5)
Spacing Criteria	1.25 (0°-180°) / 1.13 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	85.38%
Zonal Lumens in the 60 °-90 °Zone	14.13%
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

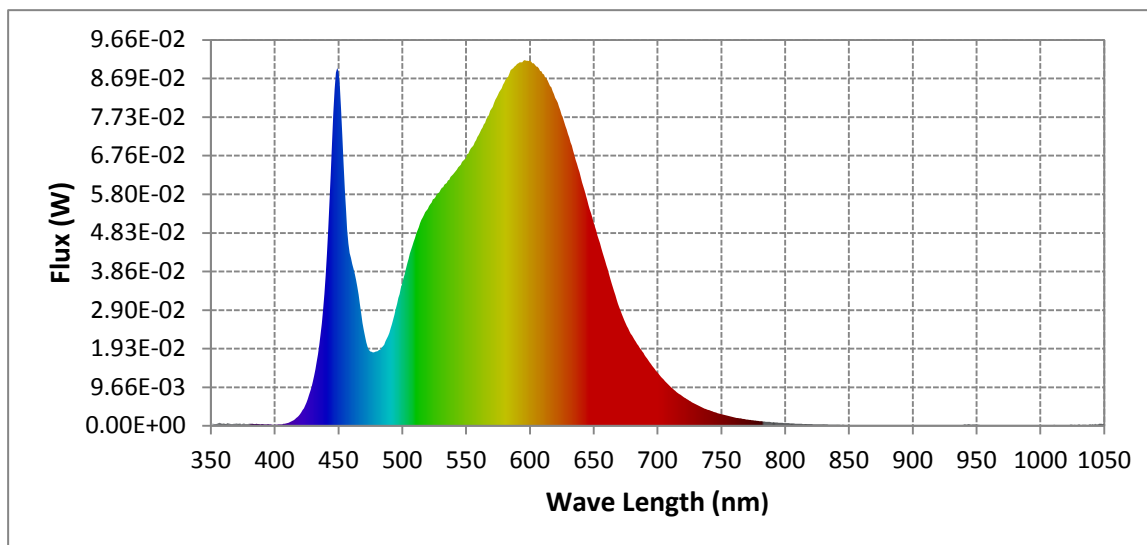
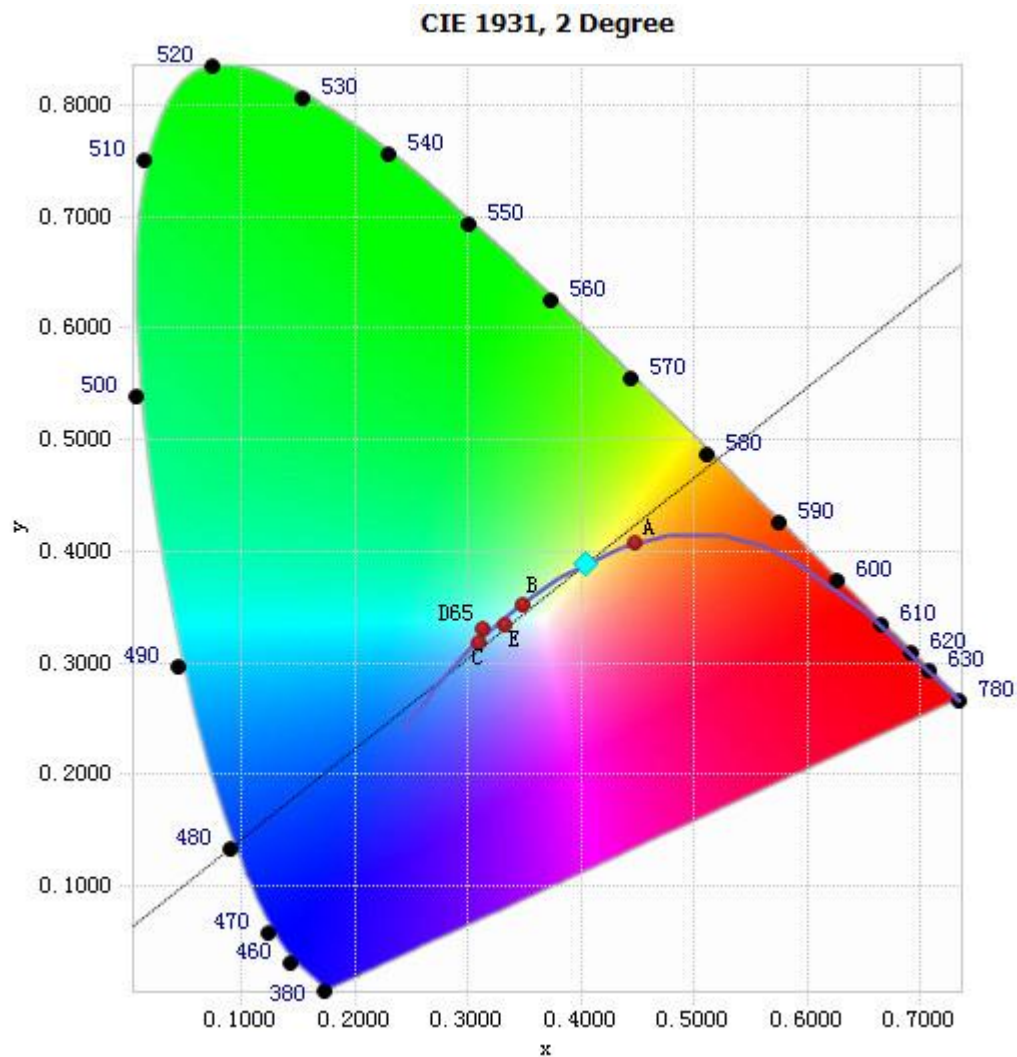


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.89E-04	485	1.99E-02	590	9.06E-02	695	1.55E-02
385	4.61E-04	490	2.33E-02	595	9.14E-02	700	1.34E-02
390	4.47E-04	495	2.93E-02	600	9.15E-02	705	1.15E-02
395	4.14E-04	500	3.56E-02	605	8.99E-02	710	9.91E-03
400	2.80E-04	505	4.17E-02	610	8.81E-02	715	8.49E-03
405	3.83E-04	510	4.70E-02	615	8.58E-02	720	7.31E-03
410	7.04E-04	515	5.15E-02	620	8.21E-02	725	6.28E-03
415	1.40E-03	520	5.43E-02	625	7.79E-02	730	5.37E-03
420	2.94E-03	525	5.68E-02	630	7.30E-02	735	4.60E-03
425	5.79E-03	530	5.91E-02	635	6.77E-02	740	3.94E-03
430	1.11E-02	535	6.07E-02	640	6.22E-02	745	3.40E-03
435	2.02E-02	540	6.29E-02	645	5.65E-02	750	2.94E-03
440	3.76E-02	545	6.50E-02	650	5.09E-02	755	2.48E-03
445	7.10E-02	550	6.69E-02	655	4.57E-02	760	2.13E-03
450	8.87E-02	555	6.98E-02	660	4.02E-02	765	1.87E-03
455	5.90E-02	560	7.28E-02	665	3.47E-02	770	1.59E-03
460	4.20E-02	565	7.58E-02	670	2.96E-02	775	1.39E-03
465	3.47E-02	570	7.93E-02	675	2.56E-02	780	1.19E-03
470	2.40E-02	575	8.28E-02	680	2.26E-02		
475	1.86E-02	580	8.59E-02	685	2.01E-02		
480	1.86E-02	585	8.90E-02	690	1.78E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4031, 0.3896)

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

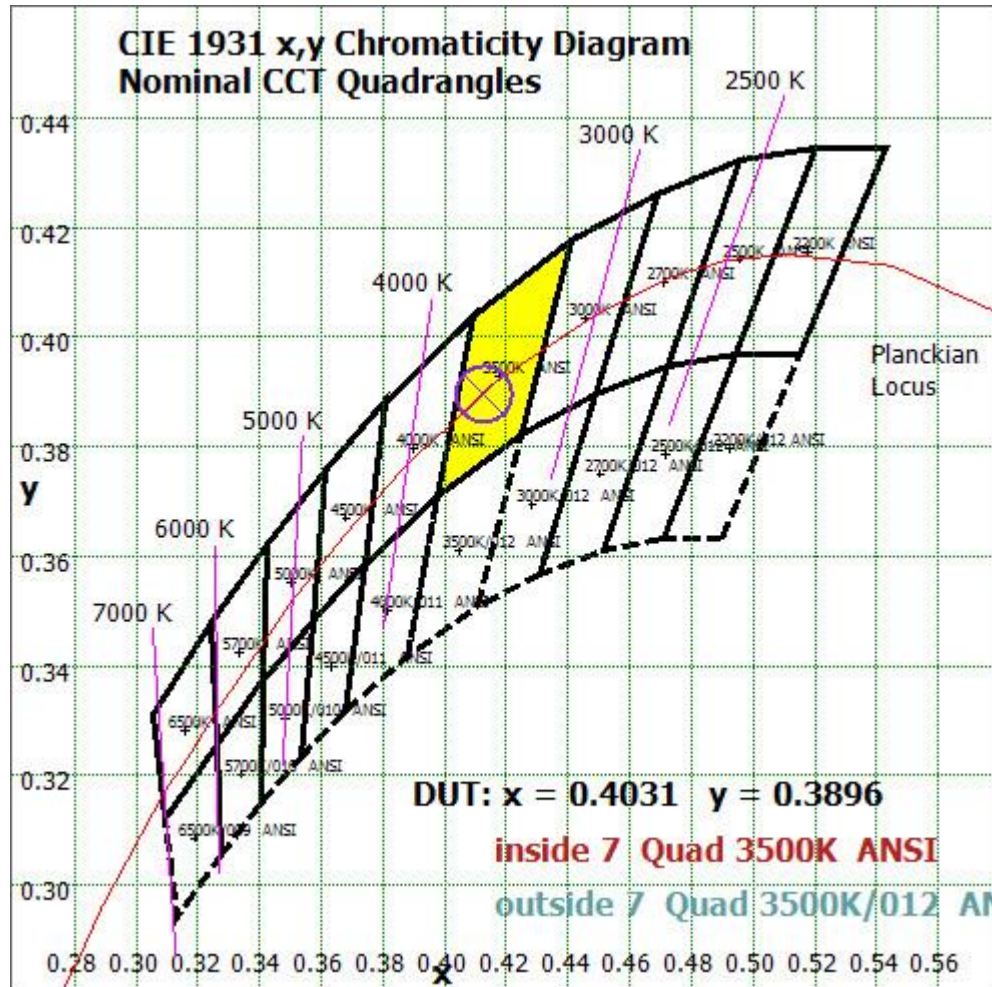


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram



Quality Assured
Color Rendition Report – Sphere Spectroradiometer Method

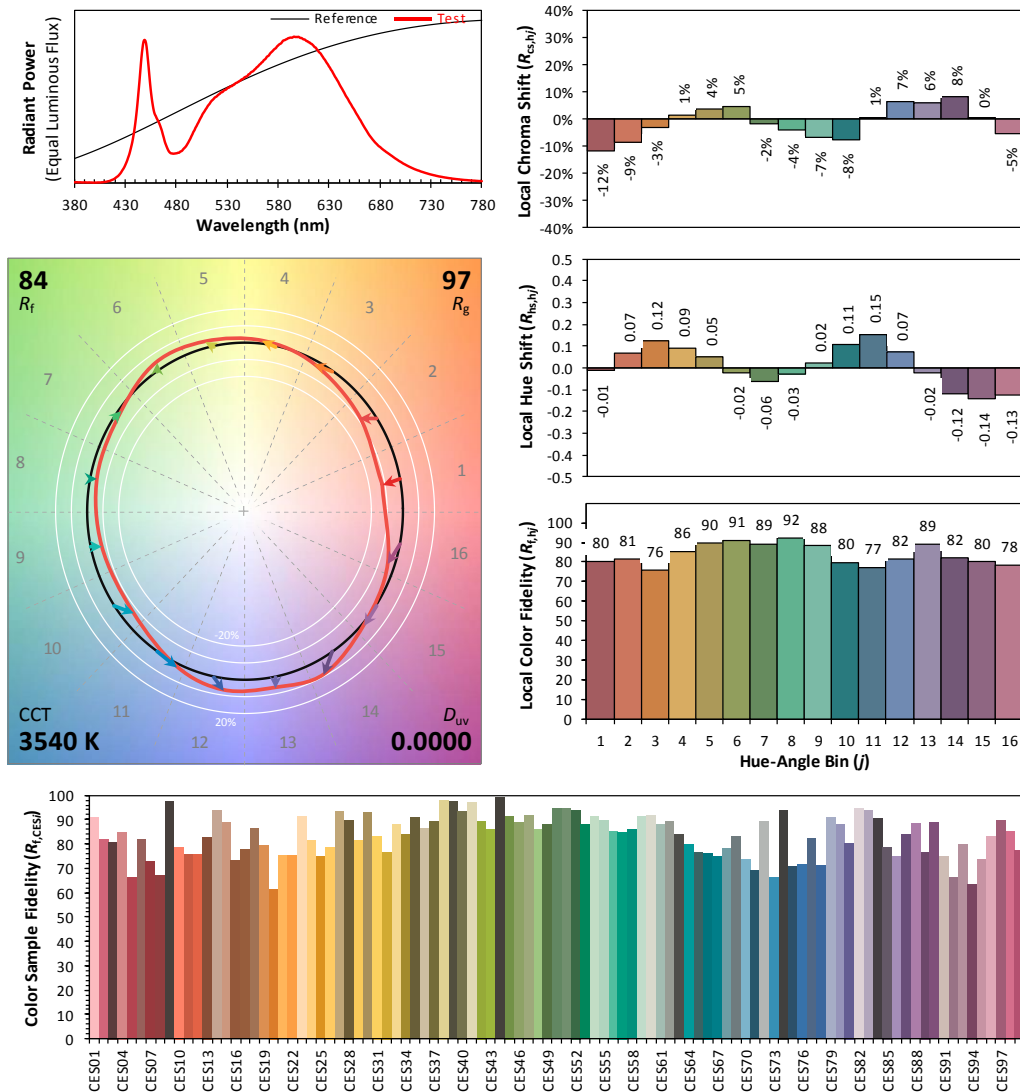
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/18

Model: ULB2-20L-U-35-L4



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

x 0.4031
 y 0.3896
 u' 0.2347
 v' 0.5105

CIE 13.3-1995
(CRI)

R_a 82
 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	210.798	4.20%
10- 20	600.31	11.97%
20- 30	888.541	17.72%
30- 40	1007.142	20.09%
40- 50	912.807	18.20%
50- 60	661.664	13.20%
60- 70	397.766	7.93%
70- 80	234.575	4.68%
80- 90	76.156	1.52%
90-100	1.387	0.03%
100-110	2.849	0.06%
110-120	4.125	0.08%
120-130	4.523	0.09%
130-140	3.921	0.08%
140-150	3.324	0.07%
150-160	2.492	0.05%
160-170	1.465	0.03%
170-180	0.459	0.01%
Total	5014.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	4281.262	85.38%
60- 90	708.497	14.13%
0-90	4989.759	99.51%
90- 180	24.545	0.49%
0- 180	5014.3	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

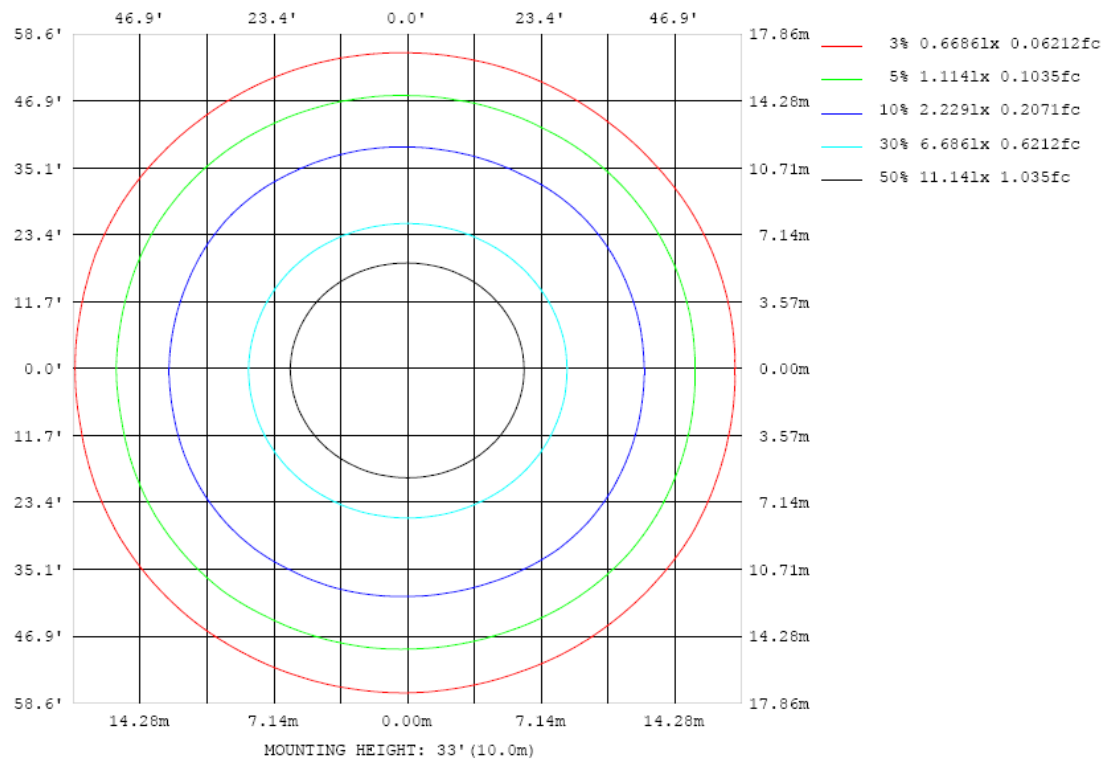


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

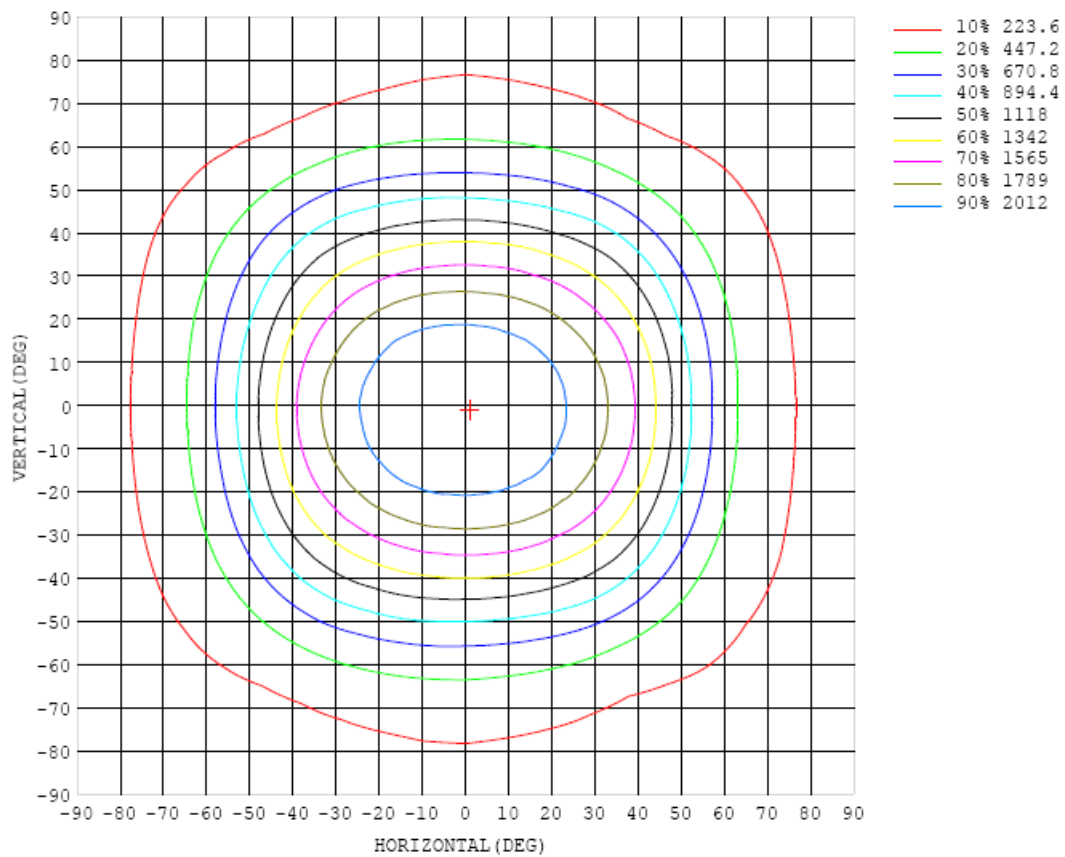


Chart 6: Isocandela Plot

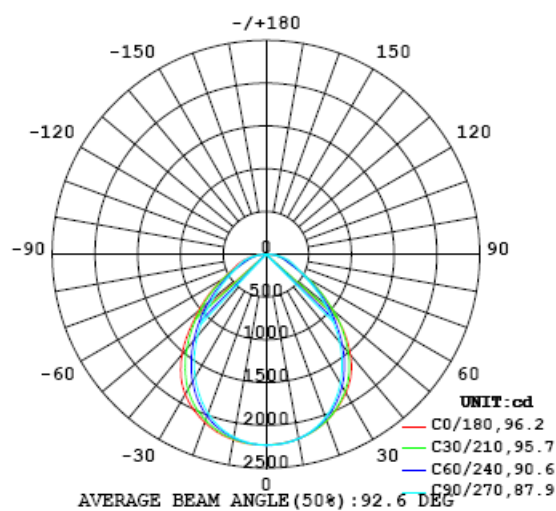


Chart 7: Polar Candela Distribution

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	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229
5	2217	2219	2212	2222	2231	2228	2221	2224	2222	2223	2219	2230	2220	2225	2222	2219	2224	2222	2225
10	2189	2189	2188	2186	2191	2187	2191	2188	2188	2189	2189	2190	2188	2197	2201	2198	2203	2203	2204
15	2140	2145	2139	2144	2147	2141	2127	2128	2125	2126	2127	2133	2137	2143	2144	2152	2157	2158	2161
20	2072	2073	2070	2065	2063	2051	2046	2037	2032	2032	2030	2046	2048	2069	2078	2081	2089	2088	2094
25	1979	1982	1977	1975	1969	1950	1929	1913	1903	1901	1907	1919	1935	1953	1967	1987	1997	2002	2002
30	1869	1871	1859	1847	1826	1801	1777	1759	1743	1740	1741	1764	1778	1810	1834	1855	1874	1884	1892
35	1730	1729	1716	1694	1667	1631	1602	1575	1556	1550	1553	1576	1597	1627	1658	1692	1717	1727	1736
40	1536	1537	1520	1496	1463	1426	1390	1365	1345	1339	1345	1365	1391	1424	1461	1490	1512	1525	1527
45	1295	1302	1293	1274	1250	1210	1166	1134	1116	1112	1125	1154	1179	1220	1254	1276	1287	1281	1277
50	1011	1019	1026	1031	1018	989	947	910	894	896	910	936	963	1001	1030	1043	1042	1031	1028
55	779	785	788	786	780	758	727	707	695	695	718	726	743	781	803	812	812	804	809
60	558	559	563	567	555	546	539	528	528	534	538	548	561	577	589	598	596	586	590
65	402	402	397	391	381	375	385	399	408	417	420	419	412	410	410	418	428	434	437
70	318	311	290	276	261	255	275	305	327	341	340	329	303	279	272	285	308	336	350
75	248	239	216	212	206	200	213	235	258	275	270	249	222	208	205	212	223	247	274
80	165	167	150	148	156	150	157	165	178	192	187	162	151	144	138	148	148	165	174
85	75.1	82.8	80.4	71.9	75.6	69.6	79.7	86.9	94.3	88.6	91.9	83.6	71.9	64.0	62.1	65.5	66.6	71.7	69.9
90	1.90	4.61	6.23	4.68	3.98	4.53	5.53	4.72	4.83	2.38	2.62	3.11	5.52	3.45	4.62	2.63	1.54	0.45	0.21
95	0.26	0.28	0.40	0.59	0.87	1.02	1.17	1.41	1.62	1.25	1.60	1.53	1.41	1.04	1.00	0.89	0.70	0.40	0.44
100	1.03	1.28	1.37	1.47	1.70	1.91	1.96	2.42	2.20	1.51	2.10	2.58	2.22	2.36	2.14	1.84	1.57	1.31	1.27
105	1.81	2.00	1.94	2.01	2.66	3.03	3.46	3.26	2.75	2.08	2.79	3.40	3.77	3.37	3.10	2.45	2.20	2.14	2.01
110	1.60	2.24	2.17	2.57	3.39	3.99	4.05	3.63	3.33	2.93	3.37	3.92	5.25	4.86	4.18	3.16	2.60	2.44	1.98
115	1.68	2.61	2.89	3.58	4.58	4.68	4.52	4.01	4.09	3.55	3.97	4.39	5.43	6.44	5.94	5.00	4.31	3.91	3.27
120	4.09	3.29	4.52	4.75	5.03	4.97	4.62	4.26	4.48	4.18	4.53	4.81	5.47	6.43	6.94	6.95	5.95	5.36	2.99
125	4.34	4.01	5.15	4.41	4.77	4.58	4.49	4.75	4.77	4.84	5.09	5.10	5.39	5.90	6.97	7.05	7.56	7.09	6.51
130	5.17	3.46	4.79	4.55	4.75	4.51	4.54	4.75	4.53	4.96	5.15	4.90	5.14	5.97	6.28	6.49	7.26	6.12	6.45
135	4.76	3.60	5.07	5.06	4.12	4.92	5.08	5.17	5.02	5.26	5.69	5.43	5.30	5.69	5.68	6.59	7.05	4.91	7.07
140	4.54	3.84	5.03	5.05	4.86	4.27	5.21	5.24	5.23	5.48	5.88	5.60	5.28	5.34	5.95	6.37	6.57	3.33	6.51
145	5.12	4.83	4.65	5.18	4.96	5.52	5.05	4.84	4.90	5.30	5.69	5.55	5.28	5.43	6.04	6.04	6.19	3.65	6.38
150	4.47	4.27	3.11	5.49	6.04	5.74	5.28	5.18	5.34	5.53	6.19	6.30	5.96	5.79	5.17	5.95	5.33	4.27	6.14
155	5.98	6.42	4.05	4.94	5.74	5.73	5.32	5.48	5.74	5.67	5.83	6.40	5.88	5.78	5.83	5.44	3.64	4.76	5.90
160	5.80	6.20	4.77	3.90	4.67	5.39	5.72	5.71	5.72	5.69	5.55	6.21	6.54	6.34	5.91	4.70	4.10	5.28	5.02
165	5.30	5.57	5.23	4.28	3.84	4.32	4.54	4.98	5.20	5.37	5.39	5.68	5.75	5.34	4.40	4.22	4.73	5.96	5.76
170	4.98	5.18	5.31	4.97	4.37	4.01	3.87	3.90	4.22	4.01	3.95	3.87	3.73	4.15	4.50	5.12	6.04	6.10	5.87
175	4.30	4.64	4.83	4.60	4.45	4.50	4.53	4.47	4.08	4.10	4.23	4.39	4.52	4.98	5.50	5.44	5.39	5.42	5.23
180	4.89	4.89	4.80	4.88	5.06	5.12	4.78	4.77	5.01	5.79	5.59	5.21	4.69	4.74	5.35	5.40	5.17	4.83	4.76

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	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229	2229		
5	2222	2215	2221	2230	2224	2218	2218	2214	2216	2211	2215	2207	2216	2211	2208	2215	2218		
10	2202	2195	2194	2189	2182	2175	2172	2170	2165	2167	2172	2169	2171	2176	2182	2185	2185		
15	2156	2144	2139	2142	2130	2113	2105	2095	2094	2092	2094	2096	2114	2116	2119	2132	2139		
20	2088	2074	2066	2052	2031	2017	1999	1984	1977	1978	1990	1998	2012	2031	2047	2059	2069		
25	1995	1980	1962	1946	1915	1880	1858	1838	1834	1832	1848	1865	1897	1919	1938	1961	1970		
30	1881	1850	1825	1790	1751	1719	1692	1667	1657	1665	1681	1703	1736	1771	1808	1838	1862		
35	1716	1686	1650	1611	1564	1525	1493	1470	1464	1467	1493	1519	1560	1601	1642	1687	1717		
40	1505	1475	1441	1403	1357	1311	1282	1259	1248	1254	1281	1303	1353	1400	1445	1489	1523		
45	1262	1243	1222	1196	1151	1101	1064	1040	1026	1027	1044	1080	1129	1183	1223	1261	1289		
50	1018	1004	995	974	933	884	853	831	817	813	830	855	908	953	981	995	1008		
55	799	786	777	755	725	687	660	641	630	631	642	658	689	718	743	760	774		
60	586	586	576	552	530	516	502	490	485	481	483	486	494	509	532	548	556		
65	439	422	394	374	365	371	382	385	386	377	368	354	342	344	363	385	402		
70	342	302	269	248	249	268	294	313	319	306	287	265	243	241	255	278	307		
75	251	216	196	189	190	192	208	235	250	234	214	201	192	194	199	208	229		
80	165	143	132	121	117	124	130	152	156	154	143	142	135	142	142	143	161		
85	71.2	60.6	51.6	49.2	42.5	47.0	51.7	59.2	56.2	62.6	62.8	61.1	55.2	61.2	63.6	72.6	83.9		
90	0.20	0.41	0.66	0.93	1.37	1.94	2.05	1.37	1.09	2.00	3.51	3.43	2.99	2.28	1.49	1.00	0.97		
95	0.43	0.64	0.90	1.08	1.37	1.51	1.62	1.82	1.22	1.79	1.50	1.22	1.02	1.04	0.78	0.54	0.37		
100	1.36	1.59	2.04	2.47	2.75	2.63	2.91	2.64	1.73	2.51	3.10	2.43	2.06	1.66	1.38	0.99	1.24		
105	2.24	2.31	2.65	3.09	3.39	3.89	3.79	3.19	2.22	3.00	3.49	3.84	3.30	2.87	2.32	1.42	1.90		
110	2.48	2.56	3.24	3.90	4.67	4.92	4.15	3.65	2.97	3.48	3.79	4.43	4.27	3.64	2.79	2.28	2.29		
115	3.61	3.99	4.46	5.41	5.88	5.24	4.42	3.89	3.63	3.85	3.92	4.43	5.02	4.53	3.70	3.07	2.64		
120	2.85	5.61	3.66	6.15	6.04	5.17	4.62	4.21	4.14	4.19	4.18	4.45	4.72	5.17	4.79	4.89	3.82		
125	6.30	7.27	6.50	4.32	5.42	4.76	4.48	4.20	4.47	4.22	4.26	4.14	4.36	4.76	5.09	5.00	3.92		
130	5.78	6.89	6.71	4.40	4.07	4.87	4.23	4.11	4.43	4.14	4.06	4.24	4.14	4.36	4.59	5.03	3.93		
135	6.40	4.56	6.41	5.60	5.60	4.29	4.25	4.83	4.85	4.66	4.29	4.42	4.57	4.05	4.70	4.83	4.07		
140	6.11	6.46	6.15	5.99	5.27	4.94	5.14	4.75	4.86	4.76	4.96	5.15	4.56	5.00	5.16	4.88	4.35		
145	6.28	5.72	4.82	5.92	5.63	5.17	4.95	5.20	4.73	5.24	4.94	5.12	5.49	5.19	4.25	5.01	5.44		
150	6.31	5.29	6.22	4.54	5.16	5.73	5.89	5.96	4.84	5.02	5.22	5.29	5.61	5.12	4.95	4.56	4.57		
155	6.18	5.60	4.90	5.79	4.69	5.10	6.25	6.07	5.00	5.65	5.11	4.78	4.82	5.05	5.28	5.58	6.49		
160	5.33	5.59	5.21	5.29	6.24	5.82	5.18	4.90	4.85	5.13	5.10	5.21	5.03	4.30	4.40	5.90	6.36		
165	5.75	6.03	5.92	5.81	5.44	5.51	5.07	5.46	4.92	4.98	5.28	4.35	4.16	4.12	4.95	5.46	5.36		
170	5.84	5.87	6.06	6.13	5.97	5.75	5.28	4.85	4.16	4.08	4.28	4.24	4.26	4.37	4.38	4.55	4.72		
175	5.25	5.28	5.33	5.28	5.20	5.17	4.89	4.58	4.53	4.55	4.37	4.64	4.69	4.54	4.55	4.63	4.90		
180	4.75	4.85	4.84	4.93	5.01	4.96	4.87	4.64	5.05	5.25	5.24	4.75	4.90	4.84	4.96	4.95	4.94		

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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