



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-L3

ULB2-20L-U-40-L3-MWS

20LB/2F/840/U/A3

20LB/2F/840/U/A3/MWS

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ25030014e

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-L3**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
125.9	4050.3	32.16	0.9952
CCT (K)	CRI	Stabilization Time (Light & Power)	
4040	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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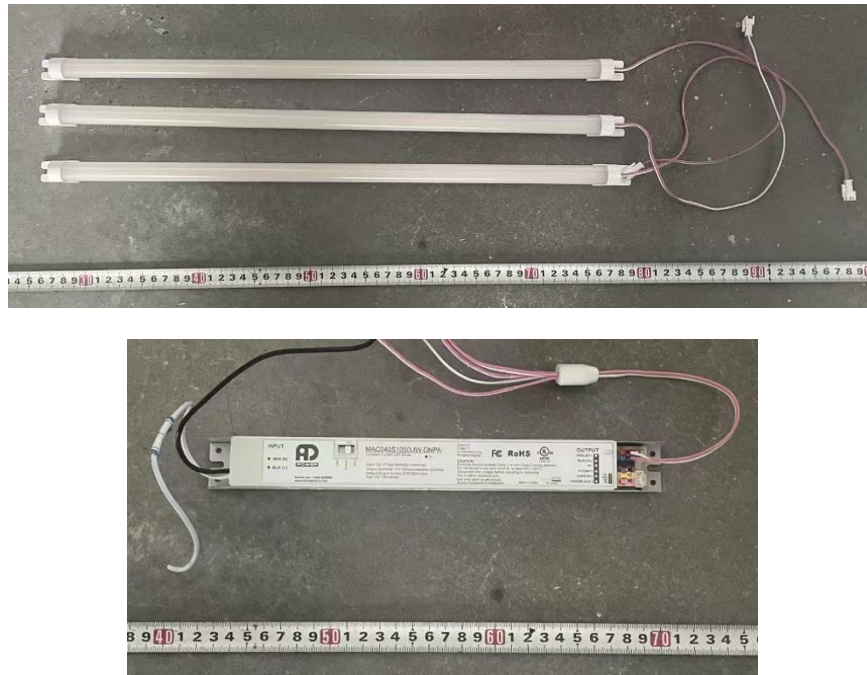
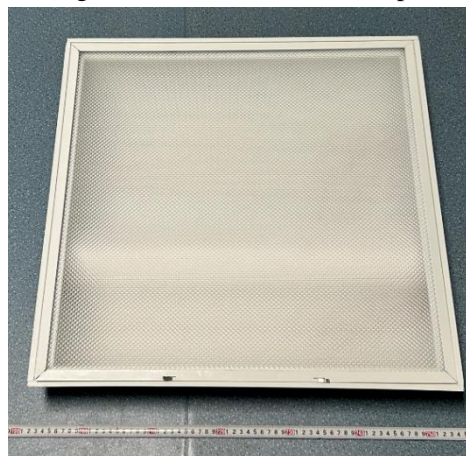


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x2

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB2-20L-U-40-L3	ULB2-20L-U-40-L3-MWS
	20LB/2F/840/U/A3	20LB/2F/840/U/A3/MWS
Electrical Ratings	: 120-277V, 50/60Hz	
Product Description	: Field-Adjustable 33W/25W/18W, 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)	0.269	0.122
Power Factor	0.9952	0.9537
Test Power (W)	32.16	32.23
THD A%	5.79	12.95
Luminous Efficacy (lm/W)	125.9	125.8
Total Luminous Flux (lm)	4050.3	4055.7
Color Rendering Index (CRI)	82.6	
R9	9	
Correlated Color Temperature (CCT)(K)	4040	
Chromaticity Chroma x	0.3793	
Chromaticity Chroma y	0.3781	
Chromaticity Chroma u	0.2238	
Chromaticity Chroma v	0.3347	
Duv	0.0010	
Chromaticity Chroma u'	0.2238	
Chromaticity Chroma v'	0.5020	

Special Color Rendering Indices	
R1	80.9
R2	87.8
R3	93.4
R4	82.5
R5	81.1
R6	83.3
R7	86.6
R8	65.5
R9	9
R10	71.5
R11	81.8
R12	60.3
R13	82.5
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)	0.269
Power Factor	0.9954
Power (W)	32.19
Luminous Efficacy (lm/W)	126.1
Total Luminous Flux (lm)	4058.4
Beam Angle (°)	97.7 (0°-180°) / 87.6 (90°-270°)
Center Beam Candle Power (cd)	1797
Maximum Beam Candle Power (cd)	1802 (At: C=70.0, Gamma=0.5)
Spacing Criteria	1.25 (0°-180°) / 1.13 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	85.27%
Zonal Lumens in the 60 °-90 °Zone	14.26%
Zonal Lumens in the 90 °-120 °Zone	0.17%
Zonal Lumens in the 120 °-180 °Zone	0.30%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

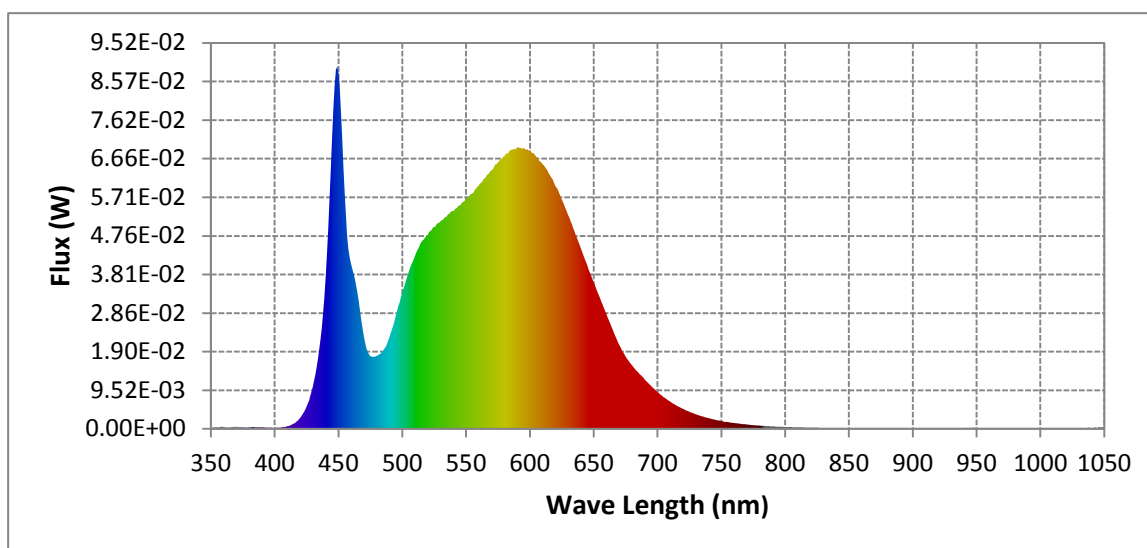
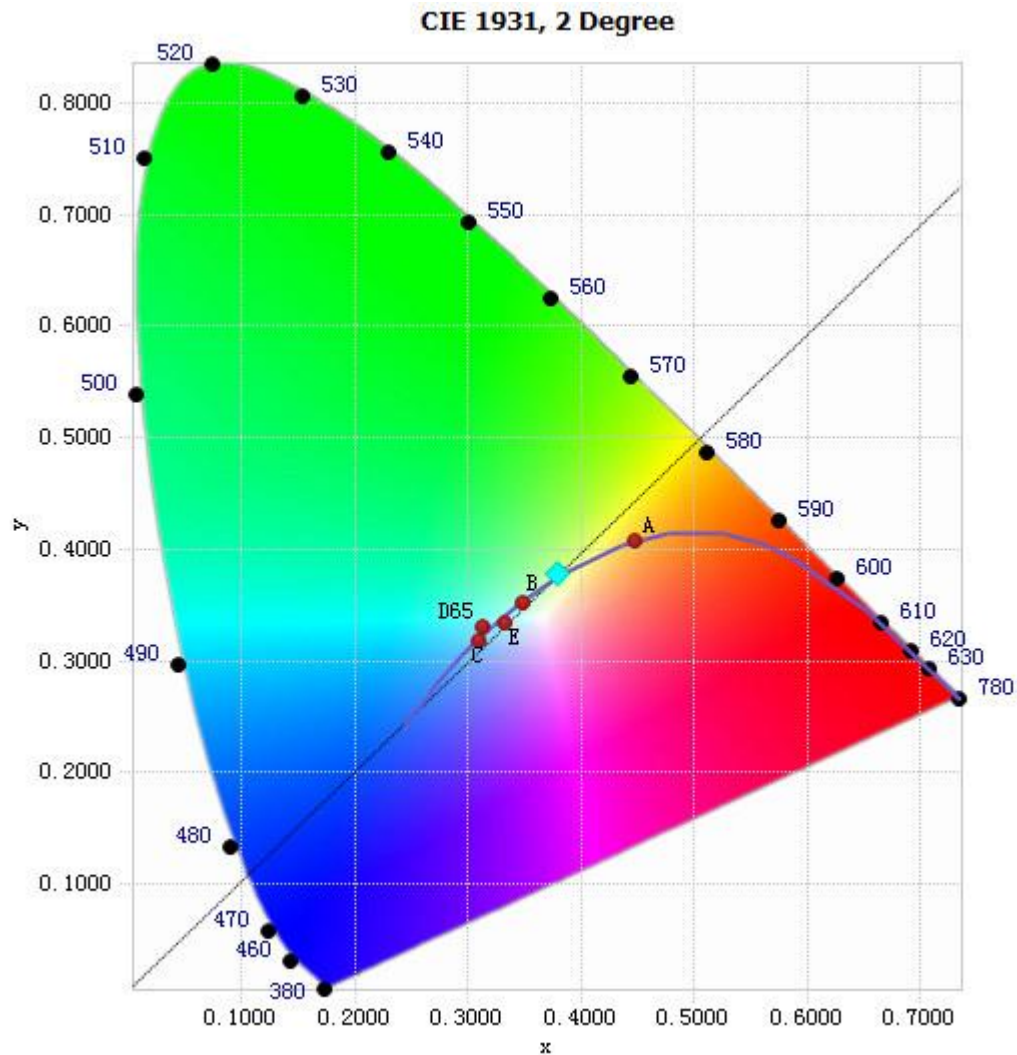


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.77E-04	485	1.92E-02	590	6.95E-02	695	1.06E-02
385	3.64E-04	490	2.26E-02	595	6.93E-02	700	9.14E-03
390	3.54E-04	495	2.79E-02	600	6.87E-02	705	7.81E-03
395	2.96E-04	500	3.35E-02	605	6.71E-02	710	6.72E-03
400	1.97E-04	505	3.86E-02	610	6.51E-02	715	5.72E-03
405	3.28E-04	510	4.27E-02	615	6.30E-02	720	4.94E-03
410	6.52E-04	515	4.60E-02	620	6.00E-02	725	4.23E-03
415	1.27E-03	520	4.78E-02	625	5.66E-02	730	3.58E-03
420	2.66E-03	525	4.98E-02	630	5.28E-02	735	3.07E-03
425	5.41E-03	530	5.12E-02	635	4.87E-02	740	2.65E-03
430	1.05E-02	535	5.23E-02	640	4.46E-02	745	2.27E-03
435	1.97E-02	540	5.37E-02	645	4.03E-02	750	1.93E-03
440	3.73E-02	545	5.51E-02	650	3.62E-02	755	1.67E-03
445	7.17E-02	550	5.64E-02	655	3.22E-02	760	1.42E-03
450	8.79E-02	555	5.81E-02	660	2.83E-02	765	1.24E-03
455	5.73E-02	560	6.00E-02	665	2.44E-02	770	1.07E-03
460	4.08E-02	565	6.18E-02	670	2.07E-02	775	9.37E-04
465	3.37E-02	570	6.38E-02	675	1.78E-02	780	8.01E-04
470	2.29E-02	575	6.57E-02	680	1.56E-02		
475	1.80E-02	580	6.72E-02	685	1.39E-02		
480	1.80E-02	585	6.88E-02	690	1.22E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3793, 0.3781)

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

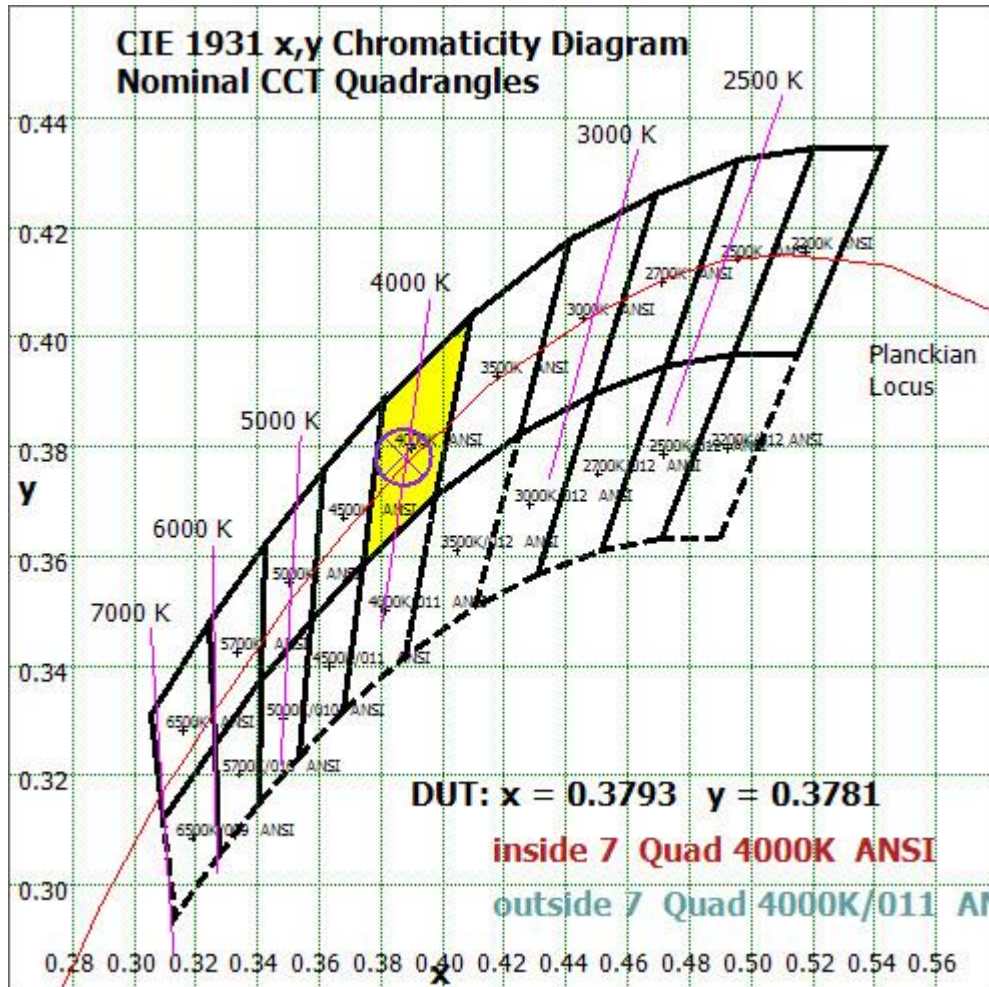


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram



Color Rendition Report – Sphere Spectroradiometer Method

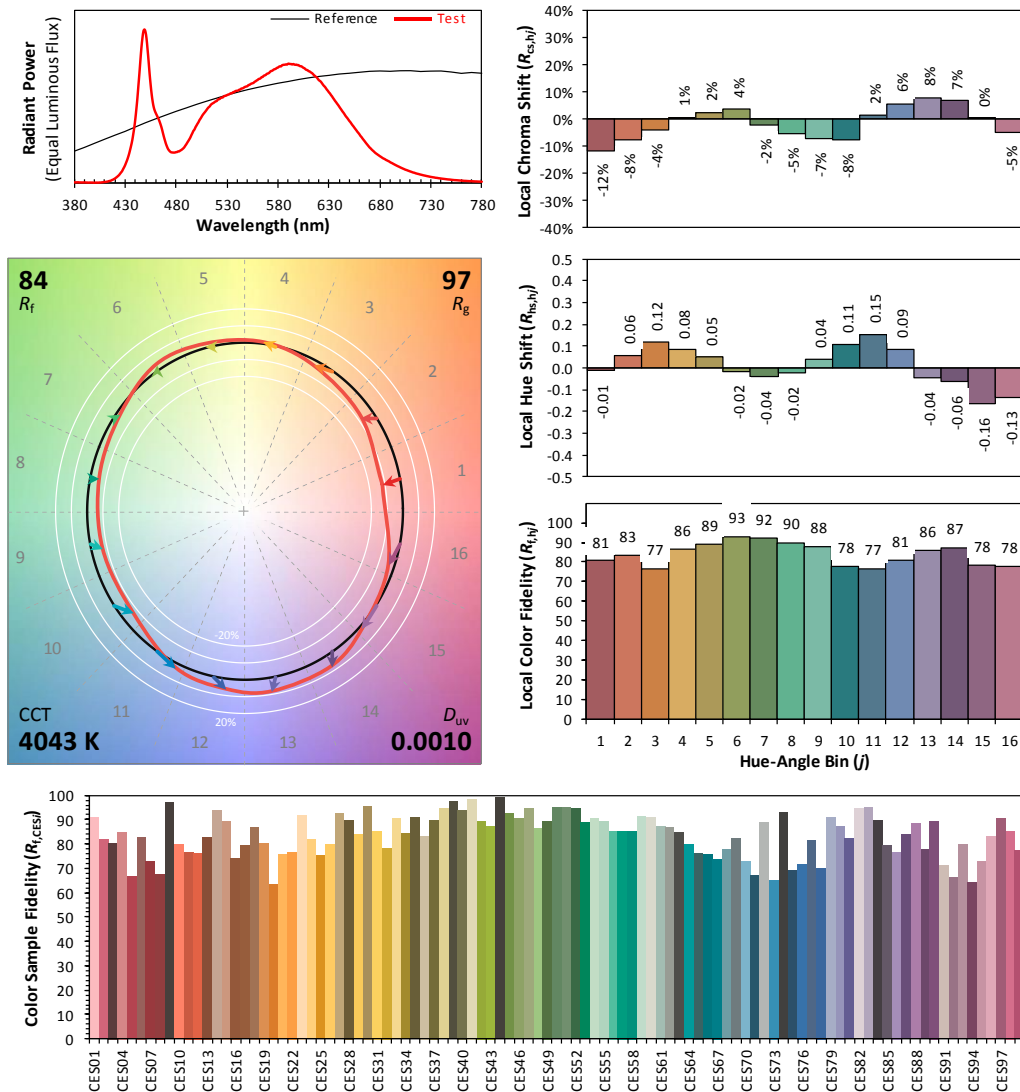
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/18

Model: ULB2-20L-U-40-L3



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

x 0.3793
 y 0.3781
 u' 0.2238
 v' 0.5020

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	169.805	4.18%
10- 20	482.77	11.90%
20- 30	715.083	17.62%
30- 40	812.267	20.01%
40- 50	741.272	18.27%
50- 60	539.371	13.29%
60- 70	324.305	7.99%
70- 80	191.581	4.72%
80- 90	62.767	1.55%
90-100	1.206	0.03%
100-110	2.365	0.06%
110-120	3.237	0.08%
120-130	3.117	0.08%
130-140	2.961	0.07%
140-150	2.676	0.07%
150-160	2.036	0.05%
160-170	1.211	0.03%
170-180	0.369	0.01%
Total	4058.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	3460.568	85.27%
60- 90	578.653	14.26%
0-90	4039.221	99.53%
90- 180	19.178	0.47%
0- 180	4058.4	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

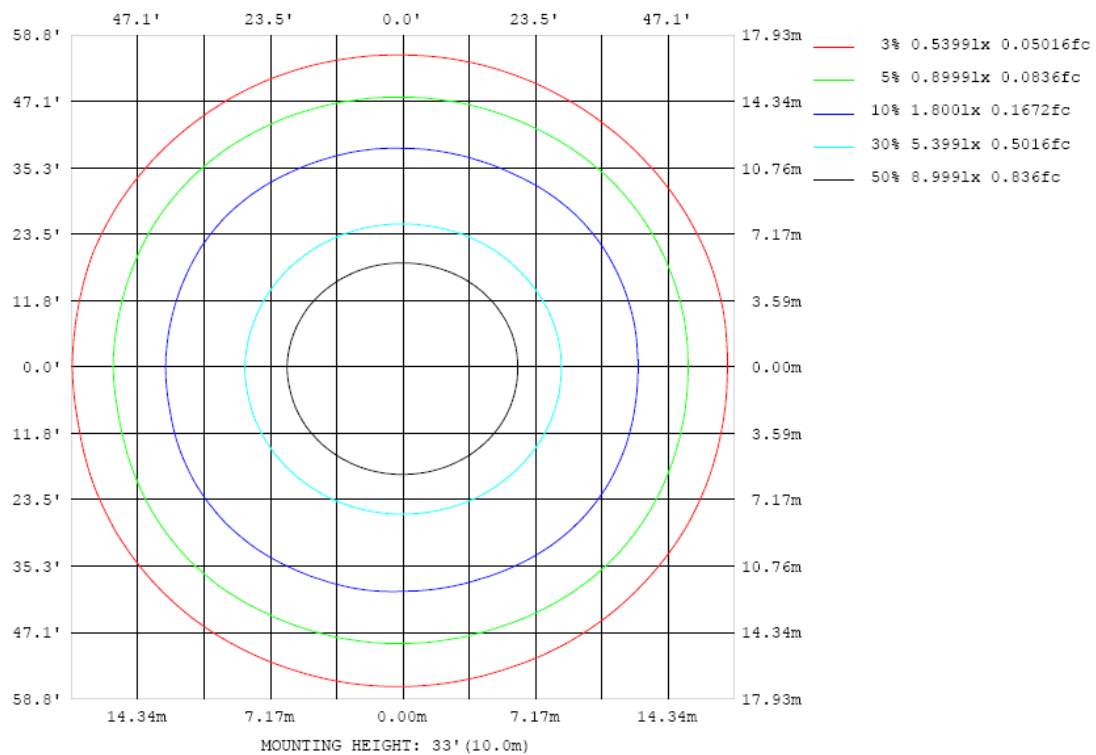


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

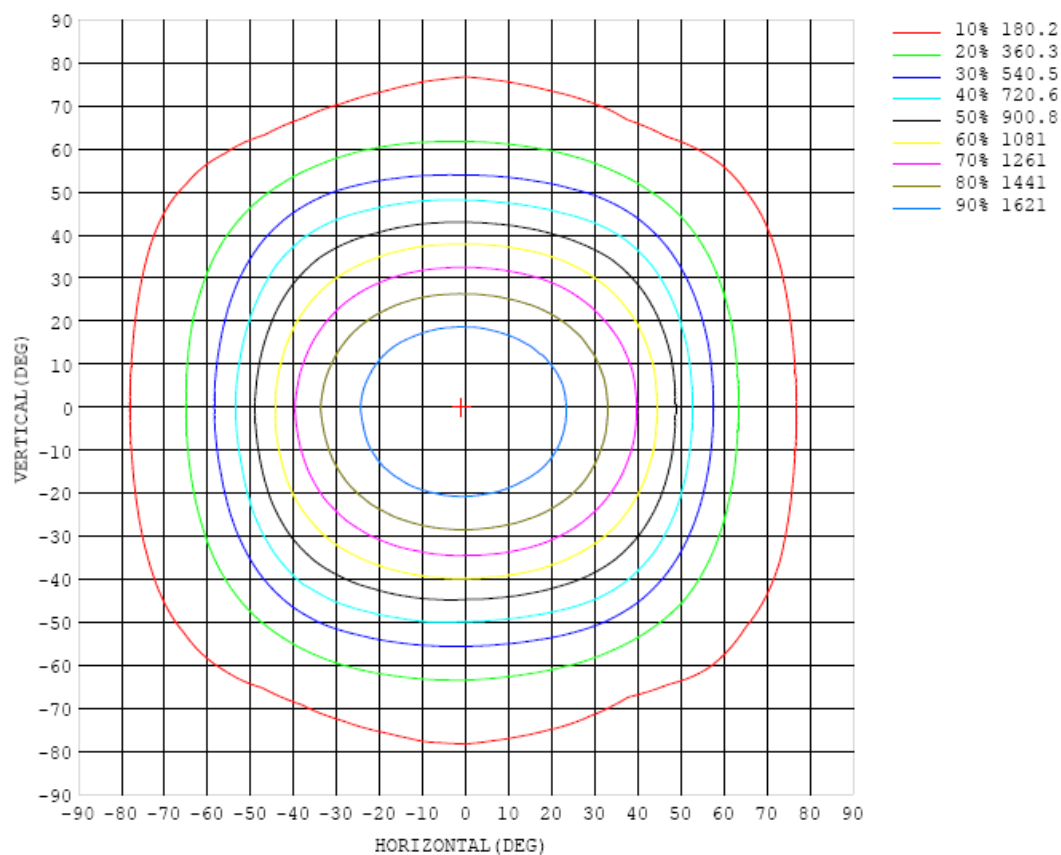


Chart 6: Isocandela Plot

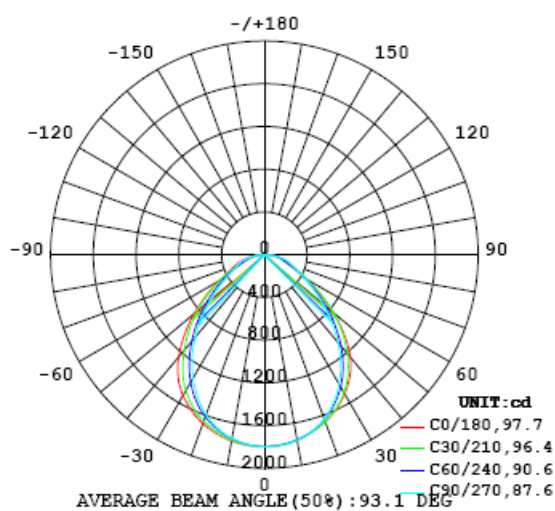


Chart 7: Polar Candela Distribution

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	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797
5	1785	1788	1788	1789	1788	1792	1787	1797	1791	1790	1793	1791	1792	1795	1793	1796	1790	1792	1788
10	1758	1760	1764	1763	1763	1763	1762	1766	1766	1765	1766	1764	1768	1766	1772	1769	1772	1770	1772
15	1719	1722	1721	1720	1717	1717	1712	1717	1712	1713	1717	1719	1721	1727	1727	1732	1731	1731	1731
20	1663	1667	1668	1664	1656	1652	1642	1642	1637	1636	1639	1645	1653	1661	1673	1679	1680	1682	1683
25	1597	1598	1596	1588	1578	1562	1546	1538	1533	1530	1535	1543	1557	1572	1585	1599	1607	1608	1612
30	1502	1506	1502	1490	1470	1452	1429	1415	1400	1397	1403	1418	1435	1457	1479	1498	1509	1516	1521
35	1394	1393	1382	1362	1338	1313	1284	1266	1250	1246	1253	1263	1286	1312	1342	1369	1387	1398	1409
40	1251	1251	1234	1208	1176	1146	1118	1095	1075	1073	1082	1098	1122	1151	1180	1207	1228	1241	1246
45	1056	1060	1052	1031	1004	972	934	912	894	891	907	927	950	983	1017	1039	1054	1055	1056
50	842	852	856	848	826	796	757	731	717	714	732	751	776	813	843	864	866	859	859
55	629	633	641	643	632	613	586	566	556	557	566	580	600	634	660	670	667	658	667
60	454	457	460	459	451	444	434	426	425	427	433	440	454	471	485	491	490	482	488
65	327	326	322	318	307	304	312	322	328	336	338	337	336	334	336	344	352	358	361
70	259	253	237	223	210	206	223	248	265	274	274	266	245	226	222	234	253	277	288
75	203	195	176	173	166	162	173	191	209	222	218	201	180	169	168	175	185	205	227
80	136	137	122	122	126	121	127	133	143	155	150	129	122	117	113	122	123	138	147
85	61.1	68.2	65.7	59.7	61.4	57.7	66.8	70.1	75.4	70.3	74.1	65.4	60.3	54.5	52.4	55.3	56.0	61.2	60.0
90	3.59	2.43	3.21	3.63	4.96	4.39	4.46	4.25	6.50	4.98	4.79	4.65	5.39	4.85	5.09	2.12	2.11	0.23	0.16
95	0.23	0.26	0.37	0.54	0.75	0.77	1.01	1.24	1.41	1.19	1.55	1.52	1.47	1.23	1.18	0.89	0.55	0.32	0.33
100	0.56	0.64	0.85	1.08	1.25	1.49	2.03	2.37	2.07	1.48	1.72	2.15	2.18	2.08	2.07	1.85	1.46	1.23	0.97
105	1.34	1.50	1.57	1.87	2.49	2.97	3.86	3.04	2.50	2.06	2.24	2.90	3.18	3.25	2.71	2.19	1.68	1.57	1.39
110	2.16	2.57	2.86	2.80	4.11	4.68	3.73	3.07	2.88	2.79	2.82	3.54	3.61	3.81	3.12	2.96	2.36	2.44	2.11
115	1.74	3.36	4.07	4.59	4.52	3.79	3.34	3.35	3.16	3.39	3.28	3.97	4.13	4.26	4.00	3.20	2.77	2.46	2.10
120	3.81	3.61	3.66	3.63	3.04	3.27	3.50	3.60	3.52	3.90	3.71	4.23	4.37	4.39	4.05	3.92	3.24	2.98	2.14
125	2.80	2.56	3.25	2.81	3.05	3.13	3.62	3.80	4.10	4.36	4.08	4.28	4.59	4.23	4.27	3.82	4.10	3.72	3.69
130	3.23	2.32	3.27	3.05	3.56	3.54	3.73	3.69	4.20	4.41	4.15	4.06	4.61	4.66	4.12	3.85	4.12	3.38	3.57
135	3.33	2.65	3.73	3.53	3.23	3.93	3.98	4.10	4.73	4.72	4.66	4.41	4.60	4.74	4.21	4.47	4.50	3.52	4.18
140	3.43	2.98	3.71	3.78	3.78	3.43	4.02	4.61	4.79	4.80	4.73	4.48	4.34	4.83	5.08	4.90	4.61	2.57	4.33
145	3.70	3.63	3.33	3.76	3.70	4.14	4.18	4.56	4.52	4.78	4.75	4.49	4.62	4.77	5.38	5.19	4.92	3.08	5.13
150	3.22	3.20	2.40	4.11	4.38	4.43	4.64	4.94	4.72	4.83	4.92	4.92	4.91	4.89	4.58	5.13	4.92	3.62	5.47
155	4.27	4.57	3.35	3.61	4.61	4.93	5.00	5.07	4.93	4.68	4.73	4.82	4.54	4.49	4.72	4.92	3.36	4.19	5.33
160	4.66	4.92	3.91	3.13	4.20	5.17	5.34	5.05	4.89	4.68	4.35	4.66	4.78	4.90	5.02	4.08	3.67	4.51	4.53
165	4.73	4.89	4.61	3.39	3.06	3.81	4.13	4.57	4.63	4.63	4.57	4.62	4.49	4.24	3.76	3.75	4.02	4.94	4.91
170	4.67	4.81	4.83	4.51	3.75	3.38	2.96	3.00	3.26	3.24	3.22	3.18	3.22	3.60	3.92	4.26	4.70	4.80	4.69
175	3.57	3.78	3.89	3.77	3.65	3.63	3.66	3.63	3.37	3.41	3.59	3.75	3.90	4.16	4.47	4.36	4.32	4.30	4.22
180	4.08	4.22	3.94	4.27	3.69	4.19	4.22	4.13	4.30	4.80	4.57	4.33	3.51	3.72	4.19	4.09	3.98	3.66	3.79

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		1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797	1797		
5		1790	1790	1788	1786	1786	1782	1790	1784	1781	1784	1781	1783	1782	1785	1783	1785	1786		
10		1770	1766	1762	1758	1756	1751	1752	1747	1747	1746	1745	1748	1751	1752	1759	1755	1759		
15		1728	1726	1718	1712	1705	1695	1693	1685	1684	1685	1685	1690	1694	1704	1707	1716	1718		
20		1679	1669	1658	1646	1631	1614	1610	1597	1593	1594	1597	1607	1620	1631	1644	1654	1663		
25		1604	1595	1577	1556	1536	1511	1496	1481	1475	1478	1485	1501	1525	1546	1568	1581	1592		
30		1515	1493	1469	1440	1408	1379	1363	1343	1335	1339	1351	1375	1401	1435	1462	1487	1502		
35		1390	1365	1331	1294	1262	1229	1205	1185	1176	1183	1198	1226	1260	1294	1328	1361	1387		
40		1230	1203	1166	1132	1095	1057	1033	1013	1005	1008	1027	1058	1094	1135	1175	1214	1245		
45		1042	1023	997	967	928	885	861	839	825	827	843	870	912	960	997	1029	1058		
50		852	839	823	796	760	716	689	671	657	657	668	693	737	781	811	832	847		
55		658	649	643	620	592	558	535	518	509	511	518	534	562	592	615	622	632		
60		485	486	472	453	435	420	408	397	391	390	391	396	404	417	436	451	459		
65		363	349	326	307	300	303	311	312	312	306	297	288	279	283	299	316	329		
70		282	248	220	202	203	218	239	254	258	248	233	215	197	196	210	228	253		
75		208	178	162	155	155	156	170	191	203	190	174	164	158	160	164	172	189		
80		139	119	111	98.6	96.7	101	104	125	128	125	116	115	111	116	118	118	134		
85		60.7	51.4	44.4	40.7	38.4	40.1	42.3	48.2	45.6	51.1	50.9	51.7	47.4	51.7	53.8	61.6	70.1		
90		0.15	0.32	0.50	0.70	1.12	0.87	0.95	1.36	0.89	2.09	0.97	2.60	2.87	2.24	1.46	0.54	0.72		
95		0.34	0.56	0.73	0.94	1.09	1.15	1.20	1.32	0.96	1.33	1.14	0.94	0.81	0.82	0.65	0.47	0.32		
100		0.91	1.20	1.35	1.46	1.91	2.07	2.06	1.76	1.40	1.77	2.06	1.87	1.67	1.39	1.20	0.87	0.70		
105		1.51	1.74	2.12	2.41	2.64	2.68	2.57	2.14	1.84	2.16	2.48	3.02	2.61	2.14	1.79	1.32	1.58		
110		2.06	2.51	2.71	2.58	3.03	3.04	2.98	2.51	2.36	2.48	2.79	3.18	3.79	3.66	3.03	2.26	2.43		
115		2.24	2.25	2.54	3.10	3.38	3.22	3.19	2.78	2.77	2.77	3.13	3.17	3.51	3.89	4.18	2.18	2.18		
120		2.22	3.00	2.84	3.15	3.41	3.37	3.42	3.19	3.32	3.17	3.33	3.46	3.30	3.15	3.34	3.81	3.26		
125		3.45	3.79	3.21	3.14	3.37	3.29	3.47	3.38	3.60	3.37	3.34	3.39	3.15	3.15	3.14	3.06	2.66		
130		2.84	3.80	3.75	3.59	3.44	3.68	3.37	3.37	3.50	3.30	3.24	3.44	3.28	3.17	3.03	3.34	2.77		
135		3.74	3.76	4.25	3.95	4.28	3.57	3.41	4.04	4.00	3.89	3.46	3.38	3.56	3.23	3.47	3.50	2.83		
140		3.90	4.68	4.64	4.62	4.05	4.02	4.22	3.89	3.76	3.64	3.78	4.07	3.52	3.75	3.90	3.76	3.20		
145		4.93	4.52	4.02	4.83	4.51	4.44	4.23	4.38	3.81	4.17	4.05	4.02	4.13	3.87	3.43	3.86	3.94		
150		5.58	4.45	5.36	3.74	4.34	4.70	4.75	4.82	3.91	3.88	4.32	4.42	4.47	3.95	3.89	3.31	3.26		
155		5.46	4.81	4.07	4.87	3.87	4.12	4.82	4.80	4.04	4.44	4.06	3.82	3.63	3.89	4.33	4.02	4.62		
160		4.69	4.68	4.04	4.20	5.03	4.82	4.25	3.97	3.88	4.04	3.86	3.88	3.91	3.59	3.59	4.75	5.09		
165		4.90	4.98	4.61	4.32	3.98	4.11	4.16	4.40	4.09	3.94	4.13	3.59	3.51	3.44	4.30	4.75	4.39		
170		4.66	4.61	4.68	4.63	4.46	4.34	4.00	3.71	3.36	3.24	3.41	3.38	3.37	3.46	3.51	3.73	3.89		
175		4.24	4.21	4.23	4.20	4.12	4.05	3.88	3.68	3.43	3.35	3.26	3.41	3.42	3.37	3.59	3.65	3.87		
180		3.80	4.03	4.06	4.13	4.19	4.08	4.16	4.03	4.26	4.36	4.31	3.84	3.92	3.86	3.93	3.89	3.85		

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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