

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-L2

ULB3-30L-U-40-L2-MWS

30LB/3F/840/U/A2

30LB/3F/840/U/A2/MWS

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ25030014m

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

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: **ULB3-30L-U-40-L2**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
131.4	4240.1	32.27	0.9957
CCT (K)	CRI	Stabilization Time (Light & Power)	
4018	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

TABLE OF CONTENT

LM-79-19 TEST REPORT.....	1
TEST SUMMARY	2
SAMPLE PHOTO	4
TEST RESULTS	5
Sphere-Spectroradiometer Method.....	5
Goniophotometer Method	6
Spectral Power Distribution - Sphere Spectroradiometer Method	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	9
Color Rendition Report – Sphere Spectroradiometer Method	10
Zonal Lumen Tabulation- Goniophotometer Method	11
Illuminance Plots- Goniophotometer Method	12
Luminous Intensity Distribution Plots- Goniophotometer Method.....	13
Luminous Intensity Data- Goniophotometer Method	14
EQUIPMENT LIST	16
TEST METHODS	16
Seasoning of SSL Product.....	16
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	16
Goniophotometer Method	17
Photometric and Electrical Measurements	17
Color Characteristics Measurements.....	17

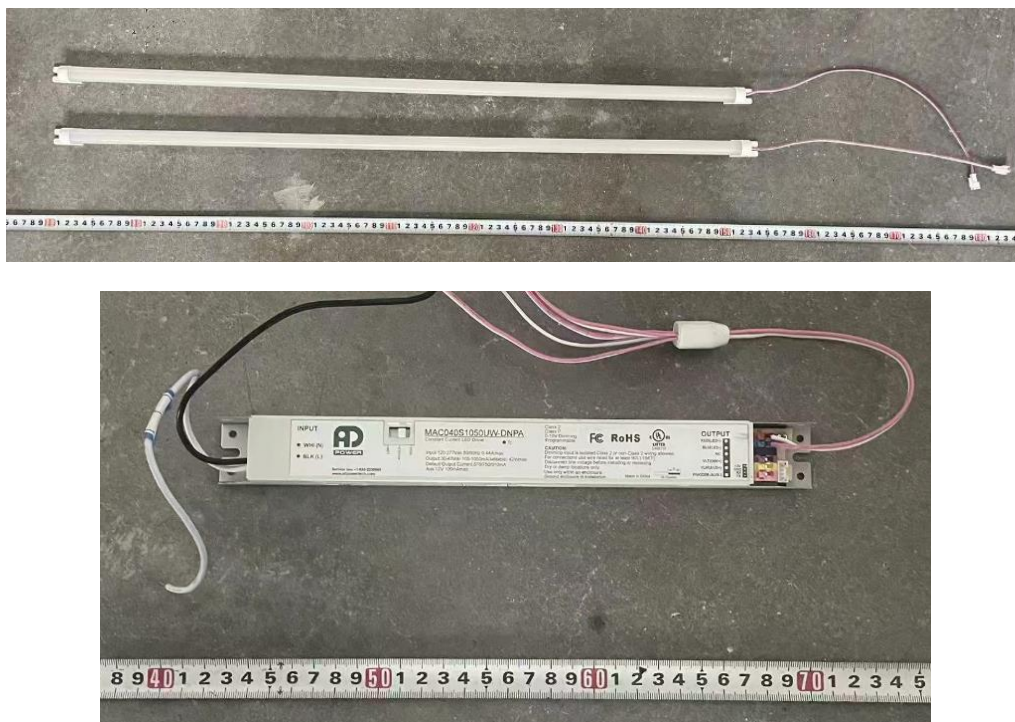


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x4

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB3-30L-U-40-L2	ULB3-30L-U-40-L2-MWS
	30LB/3F/840/U/A2	30LB/3F/840/U/A2/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)	0.270	0.122
Power Factor	0.9957	0.9541
Test Power (W)	32.27	32.34
THD A%	6.44	12.89
Luminous Efficacy (lm/W)	131.4	131.4
Total Luminous Flux (lm)	4240.1	4250.4
Color Rendering Index (CRI)	82.9	
R9	9.3	
Correlated Color Temperature (CCT)(K)	4018	
Chromaticity Chroma x	0.3798	
Chromaticity Chroma y	0.3771	
Chromaticity Chroma u	0.2245	
Chromaticity Chroma v	0.3344	
Duv	0.0004	
Chromaticity Chroma u'	0.2245	
Chromaticity Chroma v'	0.5016	

Special Color Rendering Indices	
R1	81.3
R2	88.4
R3	93.8
R4	82.6
R5	81.4
R6	83.9
R7	86.3
R8	65.3
R9	9.3
R10	72.6
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)	0.270
Power Factor	0.9954
Power (W)	32.30
Luminous Efficacy (lm/W)	131.5
Total Luminous Flux (lm)	4247.9
Beam Angle (°)	95.4 (0°-180°) / 95.8 (90°-270°)
Center Beam Candle Power (cd)	1906
Maximum Beam Candle Power (cd)	1910 (At: C=350.0, Gamma=0.5)
Spacing Criteria	1.20 (0°-180°) / 1.26 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	88.25%
Zonal Lumens in the 60 °-90 °Zone	11.51%
Zonal Lumens in the 90 °-120 °Zone	0.09%
Zonal Lumens in the 120 °-180 °Zone	0.15%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

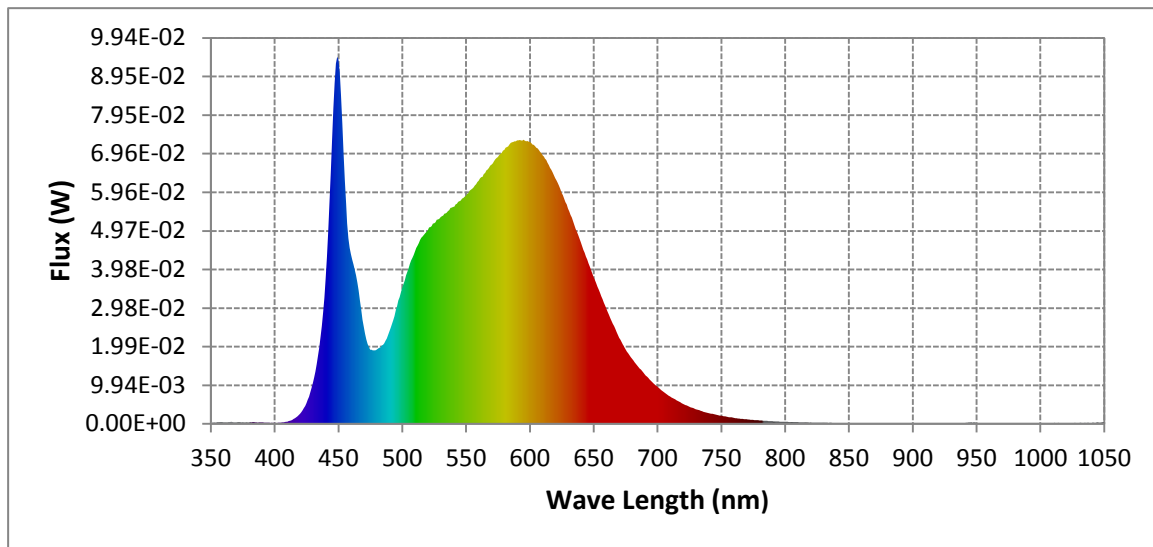
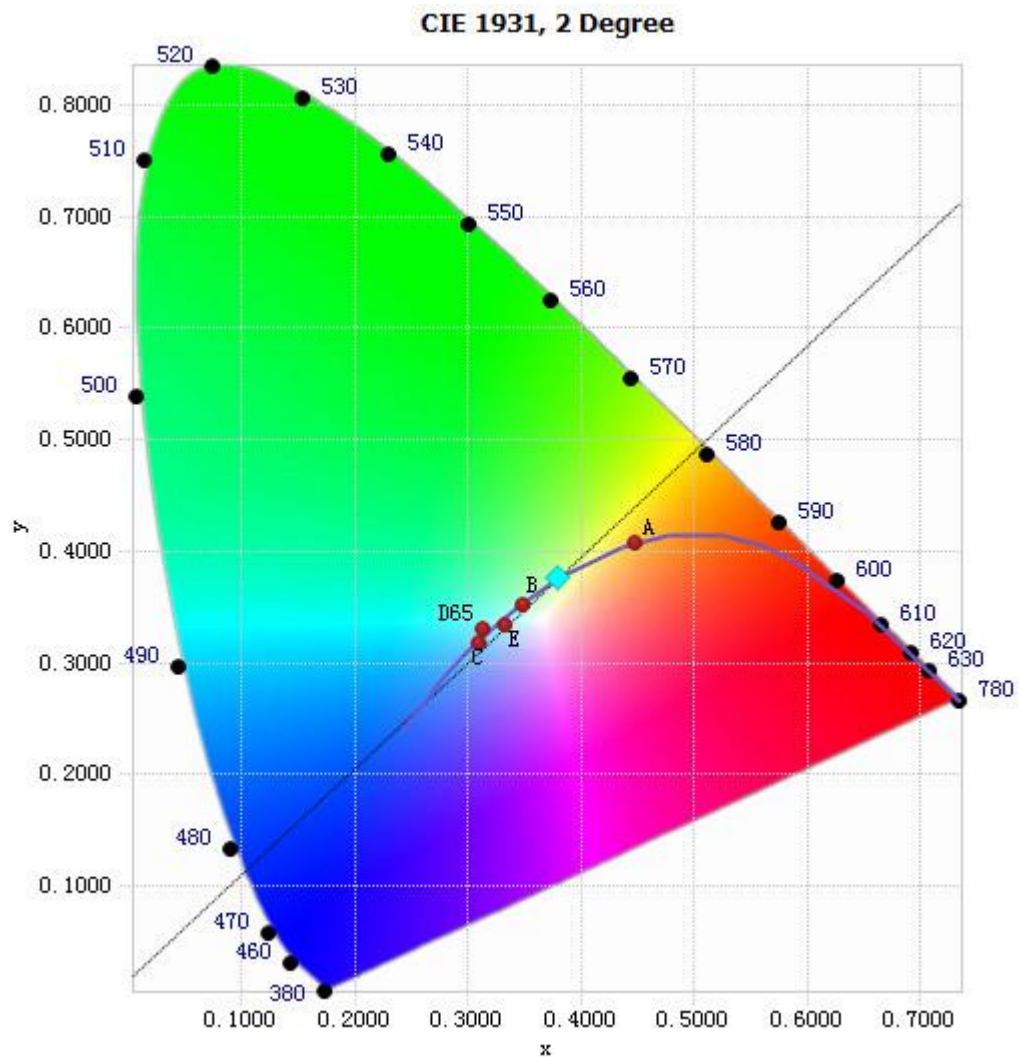


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.51E-04	485	2.04E-02	590	7.30E-02	695	1.11E-02
385	3.34E-04	490	2.38E-02	595	7.31E-02	700	9.58E-03
390	3.78E-04	495	2.92E-02	600	7.25E-02	705	8.23E-03
395	2.60E-04	500	3.50E-02	605	7.11E-02	710	7.07E-03
400	2.58E-04	505	4.00E-02	610	6.91E-02	715	6.04E-03
405	3.04E-04	510	4.44E-02	615	6.67E-02	720	5.18E-03
410	5.35E-04	515	4.79E-02	620	6.33E-02	725	4.43E-03
415	1.24E-03	520	4.98E-02	625	5.95E-02	730	3.77E-03
420	2.61E-03	525	5.16E-02	630	5.54E-02	735	3.25E-03
425	5.35E-03	530	5.32E-02	635	5.12E-02	740	2.78E-03
430	1.05E-02	535	5.43E-02	640	4.68E-02	745	2.42E-03
435	1.97E-02	540	5.58E-02	645	4.23E-02	750	2.08E-03
440	3.74E-02	545	5.73E-02	650	3.78E-02	755	1.80E-03
445	7.31E-02	550	5.86E-02	655	3.37E-02	760	1.50E-03
450	9.38E-02	555	6.06E-02	660	2.96E-02	765	1.30E-03
455	6.25E-02	560	6.26E-02	665	2.58E-02	770	1.16E-03
460	4.37E-02	565	6.46E-02	670	2.22E-02	775	1.00E-03
465	3.64E-02	570	6.67E-02	675	1.92E-02	780	9.01E-04
470	2.50E-02	575	6.87E-02	680	1.68E-02		
475	1.91E-02	580	7.05E-02	685	1.47E-02		
480	1.91E-02	585	7.23E-02	690	1.28E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3798, 0.3771)

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

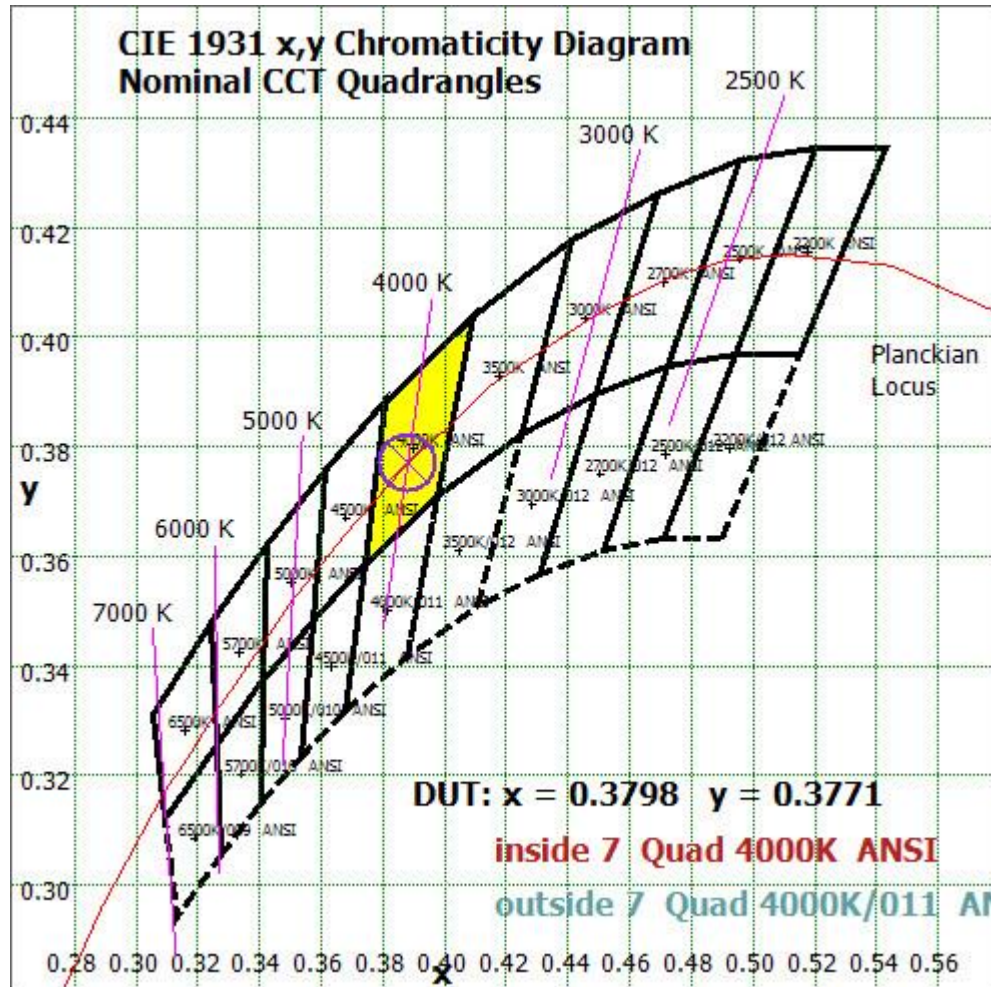


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

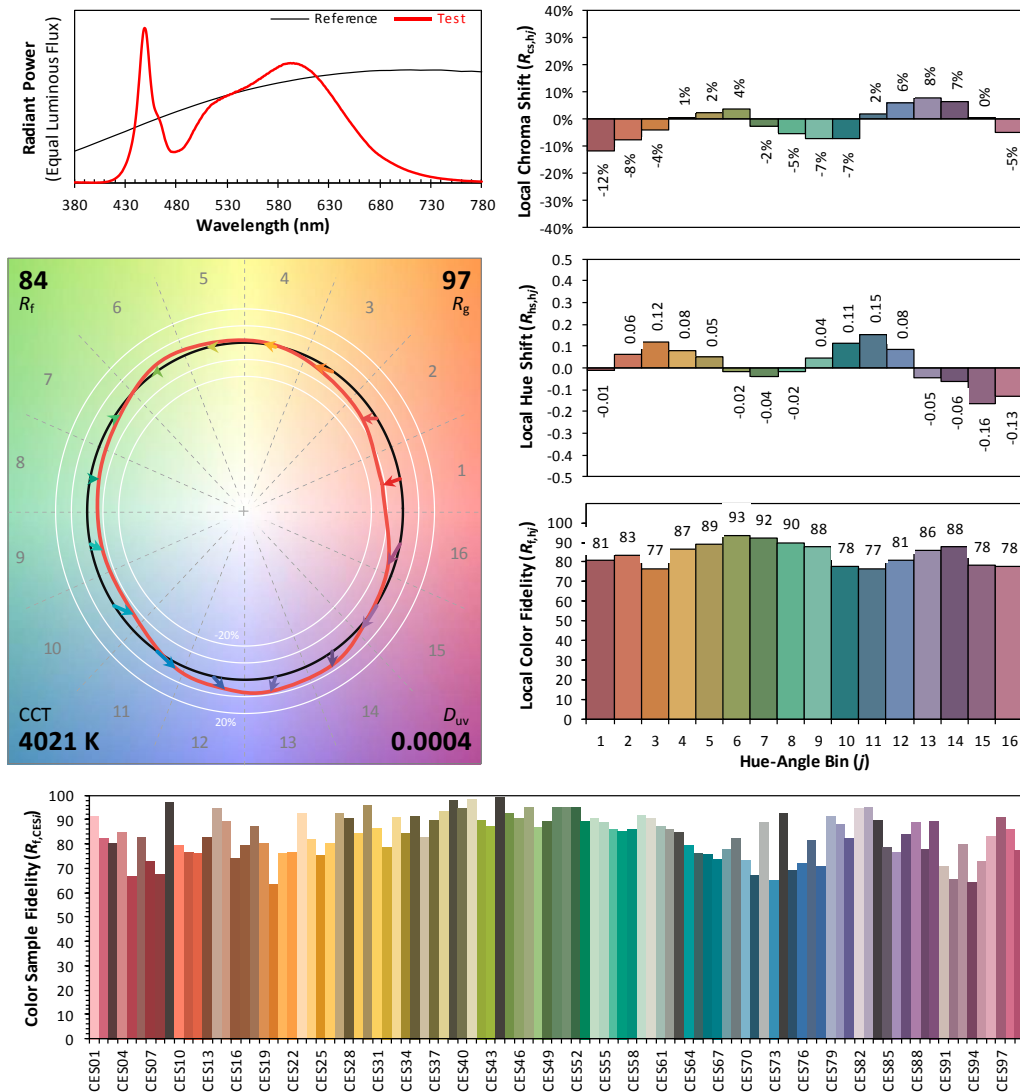
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/21

Model: ULB3-30L-U-40-L2



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

x 0.3798
 y 0.3771
 u' 0.2245
 v' 0.5016

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	180.208	4.24%
10- 20	515.221	12.13%
20- 30	775.977	18.27%
30- 40	915.214	21.54%
40- 50	843.844	19.86%
50- 60	518.446	12.20%
60- 70	277.701	6.54%
70- 80	155.266	3.66%
80- 90	55.848	1.31%
90-100	0.934	0.02%
100-110	1.644	0.04%
110-120	1.317	0.03%
120-130	1.402	0.03%
130-140	1.56	0.04%
140-150	1.432	0.03%
150-160	1.084	0.03%
160-170	0.656	0.02%
170-180	0.182	0.00%
Total	4247.9	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	3748.91	88.25%
60- 90	488.815	11.51%
0-90	4237.725	99.76%
90- 180	10.211	0.24%
0- 180	4247.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

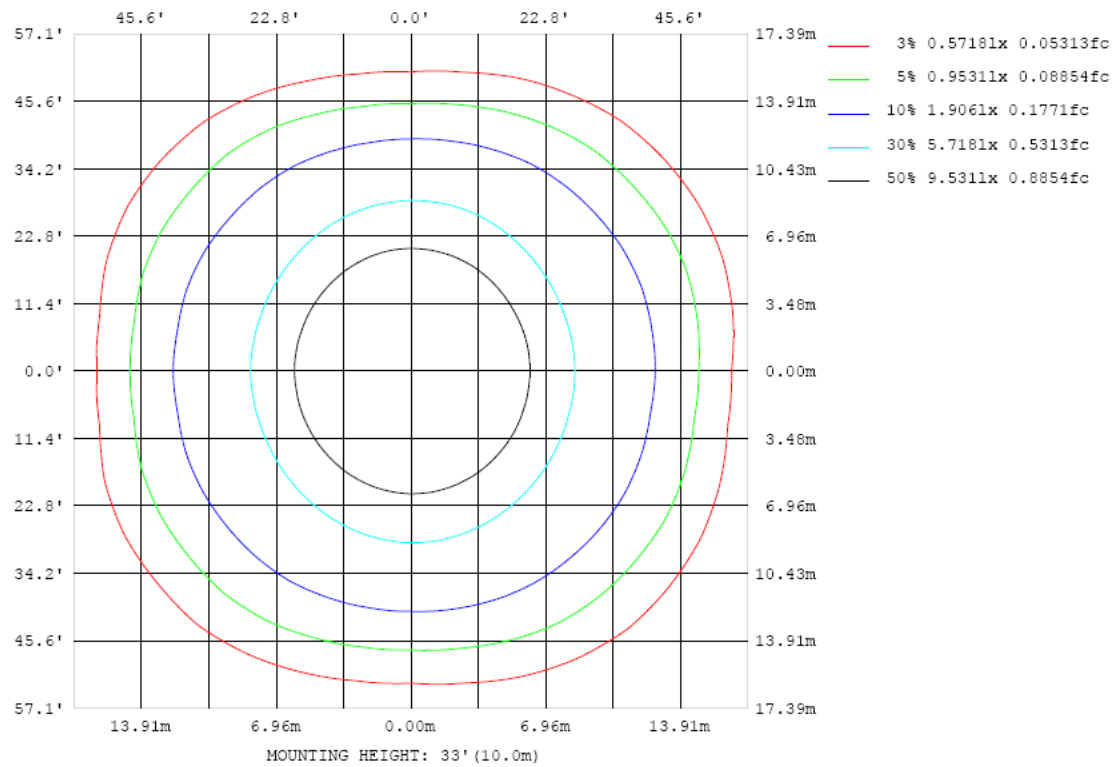


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

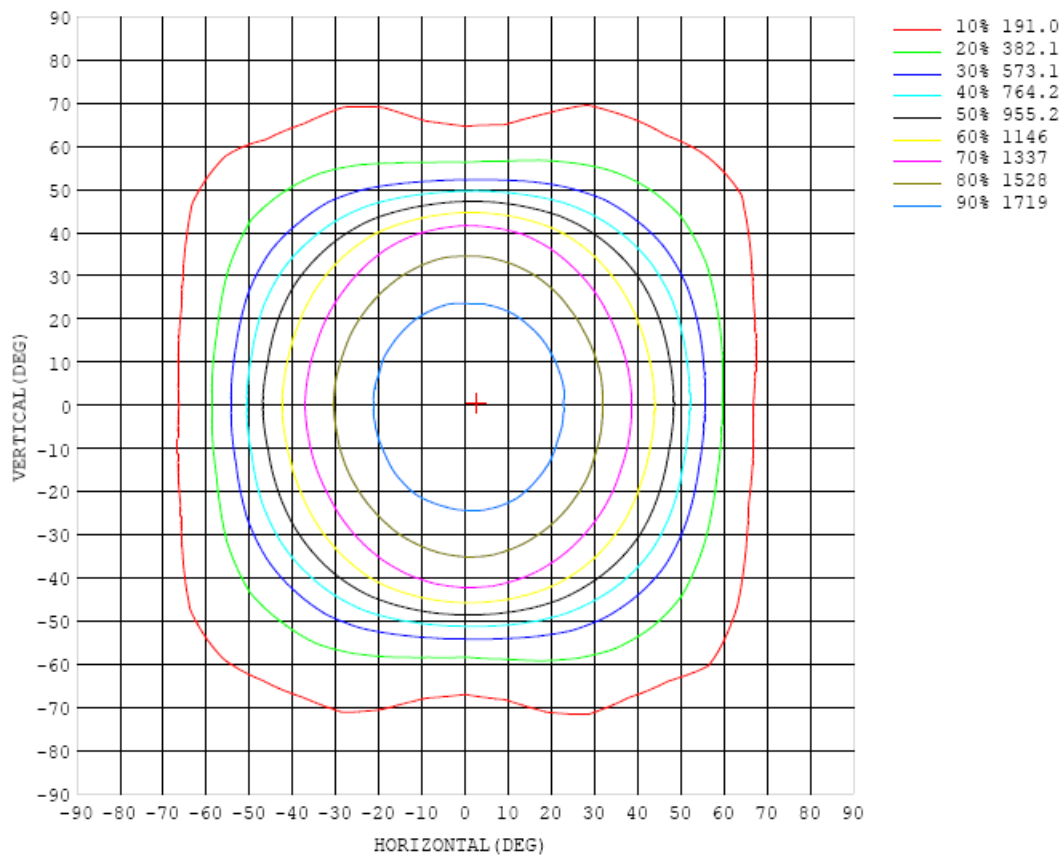


Chart 6: Isocandela Plot

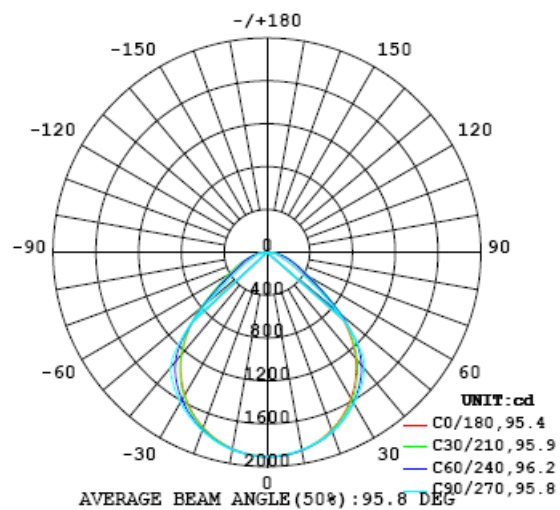


Chart 7: Polar Candela Distribution

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	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906
5	1901	1902	1894	1898	1900	1900	1900	1900	1898	1894	1892	1892	1900	1898	1895	1894	1898	1898	1891
10	1870	1874	1871	1877	1872	1876	1876	1875	1876	1869	1866	1866	1867	1866	1864	1860	1861	1865	1863
15	1832	1829	1829	1830	1832	1834	1836	1837	1835	1834	1833	1830	1829	1820	1816	1813	1813	1808	1810
20	1763	1769	1760	1770	1773	1779	1785	1786	1786	1780	1777	1773	1769	1763	1755	1746	1745	1745	1740
25	1679	1682	1686	1692	1695	1705	1710	1714	1716	1711	1703	1698	1694	1681	1671	1657	1652	1651	1653
30	1575	1576	1579	1590	1600	1610	1620	1626	1625	1624	1619	1610	1596	1580	1565	1554	1545	1535	1538
35	1443	1452	1449	1462	1474	1493	1508	1523	1536	1532	1522	1503	1484	1457	1432	1413	1407	1401	1401
40	1291	1290	1294	1310	1324	1348	1375	1398	1410	1415	1397	1372	1341	1304	1273	1244	1233	1230	1241
45	1106	1097	1103	1124	1141	1160	1182	1192	1197	1192	1183	1163	1141	1106	1072	1053	1034	1026	1045
50	877	863	881	896	896	894	897	884	869	855	851	853	863	848	833	826	815	788	802
55	604	599	631	652	646	641	624	586	545	523	535	563	597	608	599	598	583	541	541
60	366	376	421	451	462	464	438	403	357	332	347	380	412	437	431	431	406	354	341
65	226	239	294	331	333	332	326	295	245	222	235	272	308	312	308	320	297	240	216
70	145	161	214	246	231	233	246	217	174	157	172	205	235	230	221	237	221	167	146
75	108	118	161	180	159	159	176	161	132	122	128	159	173	158	159	168	168	133	119
80	84.4	95.2	125	121	104	102	118	116	102	95.5	98.9	115	118	104	97.3	113	120	108	87.3
85	52.6	60.3	71.2	69.9	58.4	57.4	62.9	64.2	58.7	56.0	58.6	63.5	59.6	54.4	48.3	58.5	64.1	56.4	49.4
90	2.85	1.64	3.22	3.02	0.71	5.52	3.83	3.18	2.54	4.01	1.89	2.12	2.10	2.20	4.06	2.12	4.24	2.48	0.45
95	0.47	0.55	0.83	0.75	0.58	0.46	0.39	0.30	0.25	0.23	0.23	0.23	0.28	0.35	0.45	0.58	0.76	0.76	0.57
100	0.47	0.47	0.58	1.27	2.04	2.01	2.04	2.15	2.25	2.26	2.06	1.40	1.40	1.54	1.02	1.08	0.81	0.84	0.96
105	0.74	0.82	0.73	0.86	0.97	1.11	1.80	2.13	2.42	2.36	2.18	1.57	1.35	1.38	0.99	0.84	1.02	1.02	1.21
110	0.91	1.32	0.89	1.05	1.01	1.04	1.09	1.28	1.55	1.61	1.49	1.19	0.92	0.92	1.01	0.98	1.21	1.23	1.28
115	1.20	1.69	1.25	1.24	1.28	1.05	1.08	0.99	0.96	0.95	0.93	0.92	0.93	0.96	1.15	1.02	1.38	1.37	1.44
120	1.63	2.02	1.30	1.48	1.65	1.35	1.20	1.08	1.06	1.04	1.03	1.04	1.06	1.16	1.31	1.13	1.55	2.06	1.47
125	1.94	2.08	1.76	1.97	2.00	1.66	1.42	1.28	1.23	1.20	1.21	1.19	1.24	1.41	1.49	1.26	1.39	2.30	1.73
130	1.17	1.61	2.71	1.47	2.44	2.23	1.77	1.55	1.41	1.35	1.35	1.37	1.46	1.60	1.79	1.45	1.41	2.02	1.73
135	1.48	2.93	3.14	1.14	2.76	2.95	2.31	1.65	1.56	1.53	1.47	1.52	1.85	1.89	2.02	1.24	1.60	2.20	1.83
140	1.52	3.02	3.15	3.50	1.17	3.05	2.82	2.10	1.92	1.76	1.89	1.78	1.82	2.10	1.44	1.61	2.22	2.14	1.32
145	1.33	2.62	3.02	3.30	3.31	1.23	2.66	2.96	2.26	2.21	1.94	2.18	2.17	1.33	1.49	2.16	2.32	2.28	1.37
150	1.43	2.72	3.13	3.37	3.80	2.37	1.35	1.24	1.76	1.81	1.74	1.36	1.43	1.64	2.31	2.55	2.28	2.19	1.51
155	1.58	2.39	3.13	3.28	2.48	2.38	3.97	3.80	2.51	1.71	1.70	1.88	2.01	2.02	2.07	2.30	2.26	2.09	1.57
160	1.41	1.56	2.08	2.23	2.73	3.57	3.73	3.69	3.22	2.72	2.57	2.42	2.29	2.25	2.41	2.08	1.80	1.78	1.45
165	1.47	1.54	2.21	2.60	2.83	3.07	3.17	3.16	2.84	2.61	2.41	2.34	2.19	2.20	2.10	1.84	1.72	1.75	1.46
170	1.60	1.63	1.80	2.22	2.32	2.33	2.41	2.33	2.38	2.26	2.17	2.21	1.81	1.77	1.78	1.82	1.86	1.72	1.56
175	1.78	1.80	1.85	1.90	1.95	2.00	1.96	2.03	2.04	2.03	1.88	1.71	1.78	2.02	2.03	1.91	1.85	1.81	1.73
180	1.74	1.77	1.78	1.79	1.77	1.76	1.71	1.73	1.50	1.65	1.71	1.67	1.71	1.75	1.74	1.75	1.72	1.72	1.73

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	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906	1906		
5	1893	1886	1894	1892	1895	1898	1896	1899	1893	1891	1898	1903	1902	1902	1899	1901	1908		
10	1864	1860	1861	1864	1864	1867	1871	1873	1872	1873	1870	1875	1876	1876	1876	1881	1881		
15	1811	1812	1818	1816	1821	1825	1826	1831	1827	1830	1834	1838	1833	1831	1833	1829	1832		
20	1740	1736	1746	1749	1756	1760	1766	1772	1771	1768	1773	1774	1774	1773	1768	1770	1773		
25	1655	1653	1657	1666	1674	1684	1692	1699	1701	1704	1698	1701	1692	1688	1686	1686	1686		
30	1539	1539	1552	1560	1576	1590	1604	1613	1616	1616	1619	1609	1598	1586	1580	1577	1579		
35	1397	1398	1411	1426	1452	1477	1498	1518	1524	1518	1509	1502	1480	1463	1449	1444	1450		
40	1233	1230	1247	1266	1296	1332	1365	1390	1401	1403	1384	1360	1332	1309	1295	1284	1291		
45	1027	1038	1050	1055	1070	1087	1089	1101	1124	1126	1135	1142	1127	1113	1102	1097	1097		
50	788	805	804	790	786	778	751	730	726	747	782	824	841	856	874	880	872		
55	541	570	574	559	556	524	475	436	425	450	494	540	581	599	627	639	626		
60	353	398	419	413	395	363	326	290	274	292	340	375	409	428	439	435	405		
65	236	289	319	284	276	275	243	204	185	195	241	290	298	307	323	314	268		
70	164	214	228	200	198	212	192	154	133	141	177	217	220	212	229	233	177		
75	127	165	158	145	132	151	146	116	104	108	133	158	149	146	161	173	128		
80	97.7	117	102	85.6	80.8	93.7	95.6	85.7	78.0	80.3	92.6	104	94.4	85.8	110	126	103		
85	53.0	59.6	50.1	38.9	36.1	39.8	42.2	40.4	37.2	39.7	46.6	49.2	48.6	48.1	63.4	66.0	63.7		
90	2.01	5.55	0.45	0.71	0.50	0.33	0.23	0.16	0.16	0.17	0.19	0.23	0.26	0.49	0.84	0.99	0.63		
95	0.97	1.04	0.88	1.19	0.88	0.65	0.51	0.43	0.39	0.36	0.36	0.41	0.47	0.52	0.63	0.68	0.72		
100	1.78	1.63	0.98	1.56	1.39	1.21	1.24	1.67	1.84	1.99	1.93	2.16	1.51	1.60	1.76	0.56	0.53		
105	1.63	2.37	1.05	1.21	1.40	2.14	2.45	2.53	2.59	2.73	2.87	2.87	2.79	2.62	1.25	0.71	0.83		
110	2.07	1.48	0.99	1.37	1.24	1.77	2.25	2.47	2.61	2.77	2.80	2.59	1.91	1.14	1.16	0.79	1.07		
115	1.86	1.53	1.10	1.36	1.21	1.25	1.36	1.61	1.72	1.70	1.50	1.27	1.18	1.29	1.37	0.94	1.70		
120	1.91	1.55	1.23	1.53	1.34	1.19	1.18	1.19	1.21	1.21	1.25	1.22	1.39	1.55	1.60	1.22	2.36		
125	2.09	1.90	1.45	1.71	1.68	1.52	1.33	1.29	1.31	1.30	1.34	1.45	1.69	1.91	2.05	0.96	2.16		
130	1.92	2.03	1.47	2.06	1.93	1.77	1.69	1.61	1.55	1.58	1.62	1.83	1.93	2.38	2.24	2.33	1.56		
135	2.36	1.92	1.26	1.99	2.26	2.13	1.79	1.87	1.79	1.84	2.08	2.08	2.49	2.67	1.20	3.40	2.98		
140	1.98	2.32	2.09	1.51	2.36	2.36	2.22	2.11	2.15	2.13	2.64	2.53	2.93	1.64	2.66	3.66	3.07		
145	2.11	2.34	2.46	2.01	1.65	2.15	2.48	2.52	2.71	2.79	2.47	2.49	1.81	1.85	3.50	3.26	2.63		
150	2.04	2.31	2.55	2.54	2.02	1.58	1.96	1.82	2.02	1.76	1.93	1.44	1.74	3.53	3.86	3.11	2.77		
155	2.01	2.17	2.38	2.26	2.36	2.20	2.09	1.75	1.66	1.78	2.36	3.03	2.87	2.41	3.04	3.10	2.84		
160	1.74	1.89	1.84	2.08	2.55	2.37	2.23	2.65	2.81	3.04	3.26	3.63	3.47	3.09	2.35	2.15	1.94		
165	1.51	1.67	1.71	1.80	2.14	2.36	2.40	2.56	2.67	2.87	2.89	2.86	2.97	2.76	2.49	2.37	2.06		
170	1.56	1.72	1.82	1.82	1.74	1.83	1.93	2.22	2.17	2.22	2.31	2.24	2.22	2.08	2.22	2.17	1.88		
175	1.74	1.83	1.98	2.06	2.09	2.04	1.83	1.74	1.75	1.91	1.92	1.95	1.87	1.91	1.97	1.89	1.78		
180	1.73	1.75	1.77	1.77	1.78	1.79	1.77	1.76	1.63	1.61	1.60	1.73	1.73	1.75	1.73	1.72	1.74		

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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