

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-L2

ULB2-20L-U-35-L2-MWS

20LB/2F/835/U/A2

20LB/2F/835/U/A2/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.: HZ25030014a

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

1 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-35-L2**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
124.4	2726.4	21.92	0.9953
CCT (K)	CRI	Stabilization Time (Light & Power)	
3532	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

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

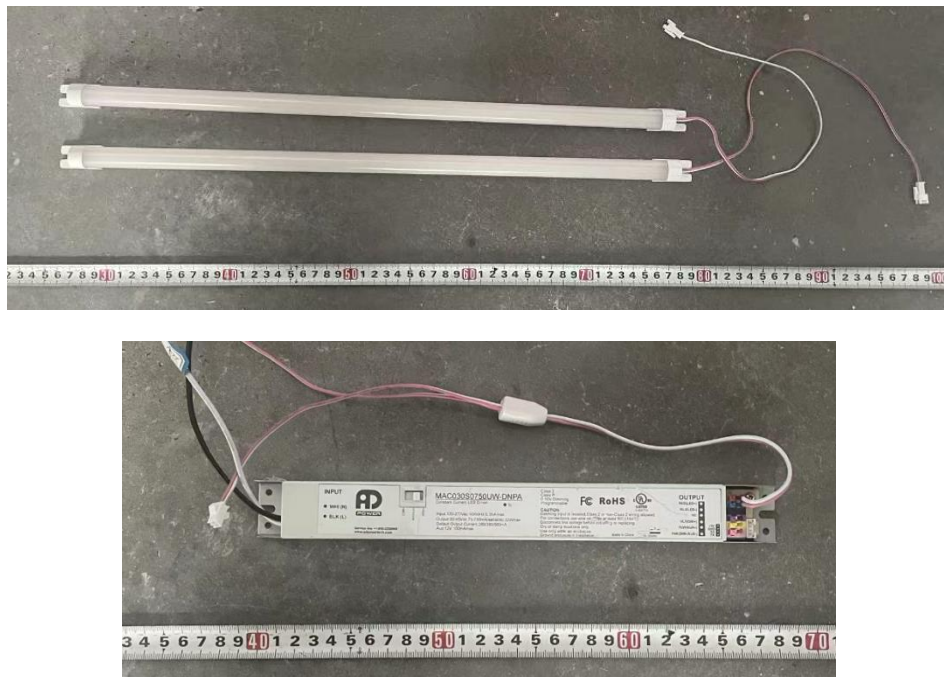
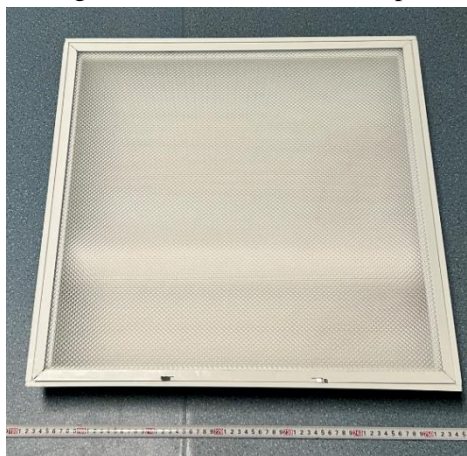


Figure 1- Overview of the sample



Sample in Lithonia 2GT8 lensed 2x2

Equipment Under Test(EUT)

Name	: LED Retrofit-kits	
Model	: ULB2-20L-U-35-L2	ULB2-20L-U-35-L2-MWS
	20LB/2F/835/U/A2	20LB/2F/835/U/A2/MWS
Electrical Ratings	: 120-277V, 50/60Hz	
Product Description	: Field-Adjustable 22W/18W/14W, 3500K LED Tube supplied by a LED driver: MAC030S0750UW-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)	0.184	0.083
Power Factor	0.9953	0.9533
Test Power (W)	21.92	21.84
THD A%	6.01	10.11
Luminous Efficacy (lm/W)	124.4	124.5
Total Luminous Flux (lm)	2726.4	2718.6
Color Rendering Index (CRI)	82.3	
R9	8.4	
Correlated Color Temperature (CCT)(K)	3532	
Chromaticity Chroma x	0.4035	
Chromaticity Chroma y	0.3902	
Chromaticity Chroma u	0.2348	
Chromaticity Chroma v	0.3405	
Duv	0.0001	
Chromaticity Chroma u'	0.2348	
Chromaticity Chroma v'	0.5108	

Special Color Rendering Indices	
R1	80.6
R2	88.2
R3	94.5
R4	81.8
R5	80.6
R6	84.2
R7	85.3
R8	63.2
R9	8.4
R10	72.5
R11	81
R12	62.7
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)	0.184
Power Factor	0.9954
Power (W)	21.94
Luminous Efficacy (lm/W)	125.0
Total Luminous Flux (lm)	2743.4
Beam Angle (°)	99.2 (0°-180°) / 88.3 (90°-270°)
Center Beam Candle Power (cd)	1200
Maximum Beam Candle Power (cd)	1201 (At: C=330.0, Gamma=0.5)
Spacing Criteria	1.26 (0°-180°) / 1.15 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	85.01%
Zonal Lumens in the 60 °-90 °Zone	14.55%
Zonal Lumens in the 90 °-120 °Zone	0.16%
Zonal Lumens in the 120 °-180 °Zone	0.28%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

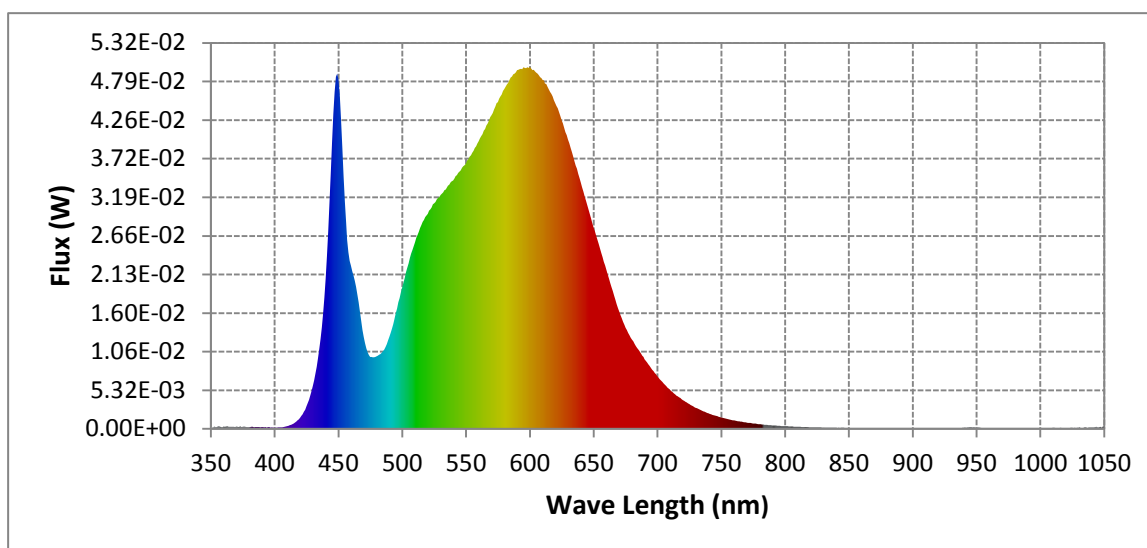
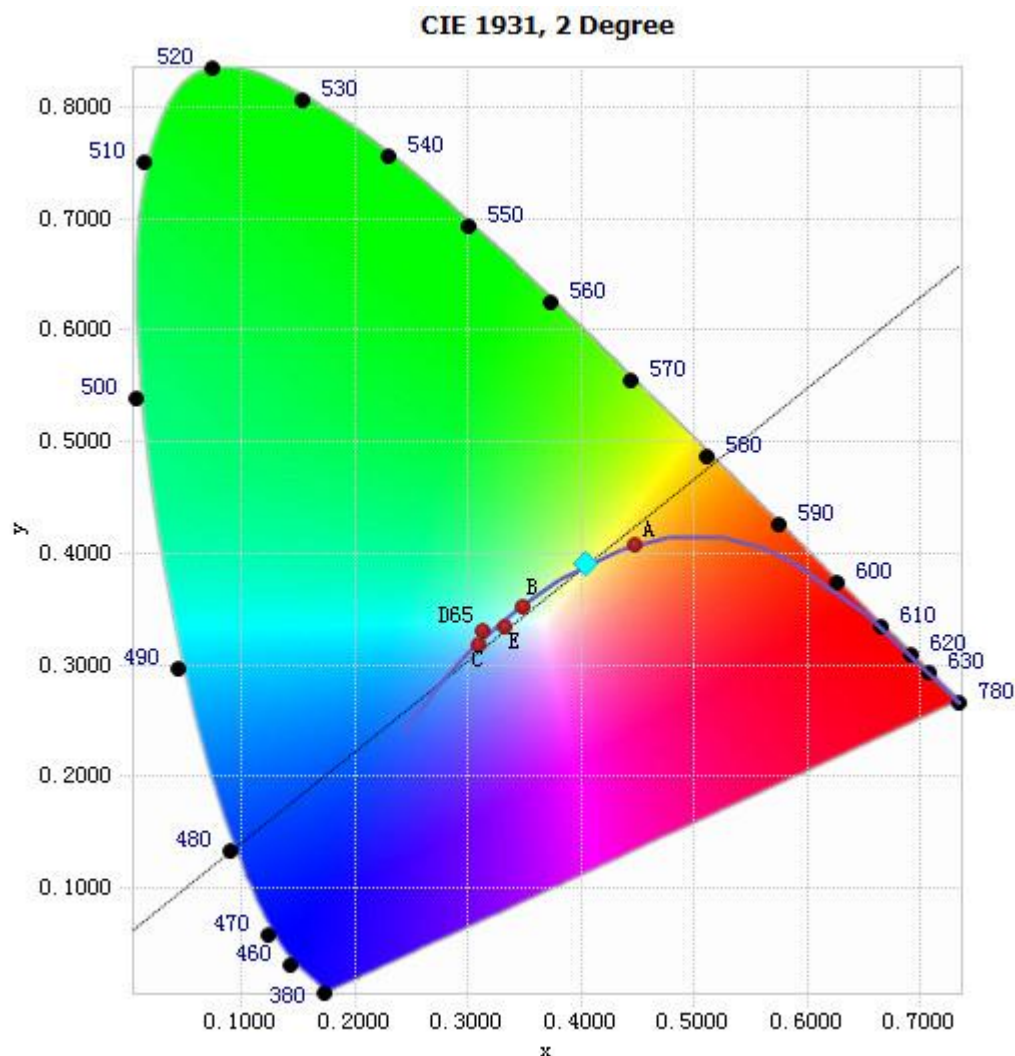


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.21E-04	485	1.07E-02	590	4.94E-02	695	8.40E-03
385	2.21E-04	490	1.27E-02	595	4.98E-02	700	7.26E-03
390	2.46E-04	495	1.59E-02	600	4.99E-02	705	6.26E-03
395	2.22E-04	500	1.95E-02	605	4.91E-02	710	5.37E-03
400	1.69E-04	505	2.28E-02	610	4.81E-02	715	4.59E-03
405	1.92E-04	510	2.57E-02	615	4.68E-02	720	3.96E-03
410	3.67E-04	515	2.81E-02	620	4.49E-02	725	3.42E-03
415	7.38E-04	520	2.96E-02	625	4.25E-02	730	2.91E-03
420	1.51E-03	525	3.11E-02	630	3.98E-02	735	2.48E-03
425	3.12E-03	530	3.22E-02	635	3.69E-02	740	2.12E-03
430	5.95E-03	535	3.32E-02	640	3.40E-02	745	1.81E-03
435	1.10E-02	540	3.42E-02	645	3.09E-02	750	1.57E-03
440	2.07E-02	545	3.55E-02	650	2.77E-02	755	1.35E-03
445	3.95E-02	550	3.66E-02	655	2.49E-02	760	1.16E-03
450	4.82E-02	555	3.80E-02	660	2.19E-02	765	1.01E-03
455	3.13E-02	560	3.97E-02	665	1.90E-02	770	8.68E-04
460	2.25E-02	565	4.13E-02	670	1.62E-02	775	7.37E-04
465	1.85E-02	570	4.32E-02	675	1.39E-02	780	6.42E-04
470	1.26E-02	575	4.50E-02	680	1.23E-02		
475	9.92E-03	580	4.68E-02	685	1.09E-02		
480	1.00E-02	585	4.84E-02	690	9.61E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4035, 0.3902)

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

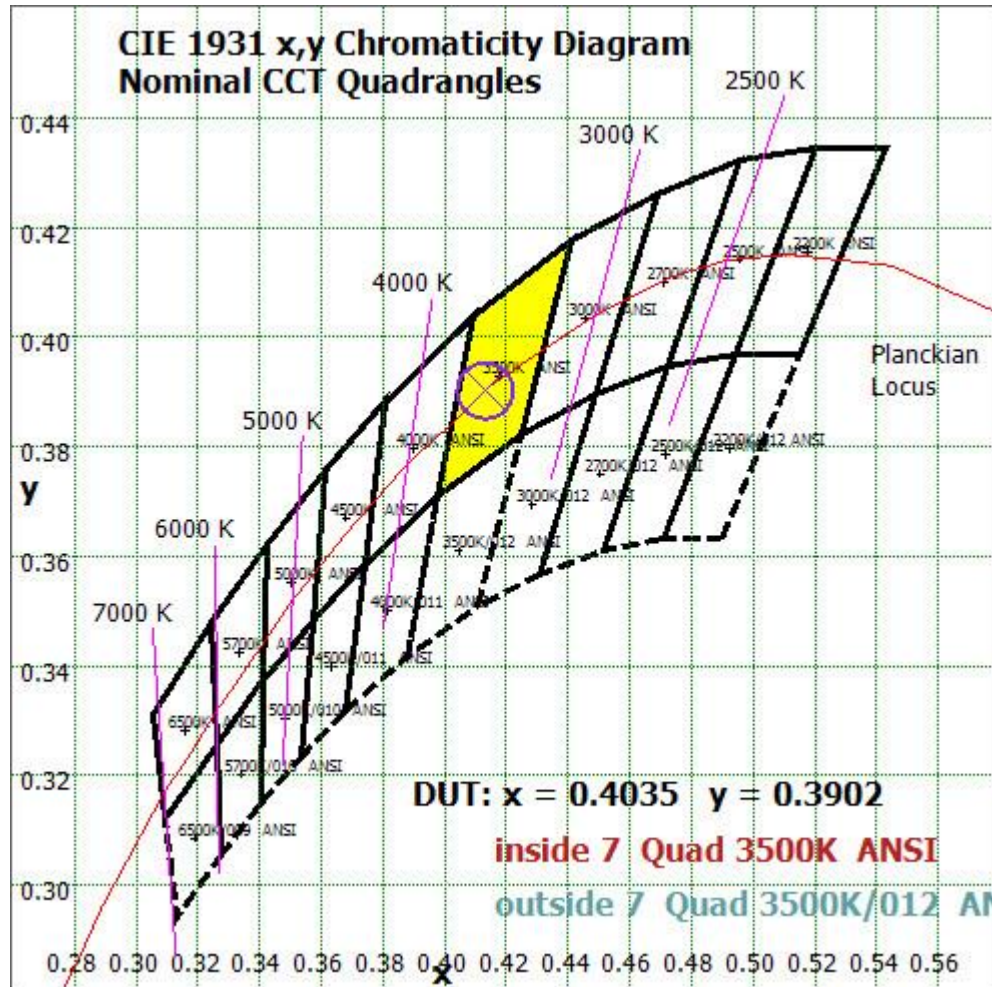


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram



Color Rendition Report – Sphere Spectroradiometer Method

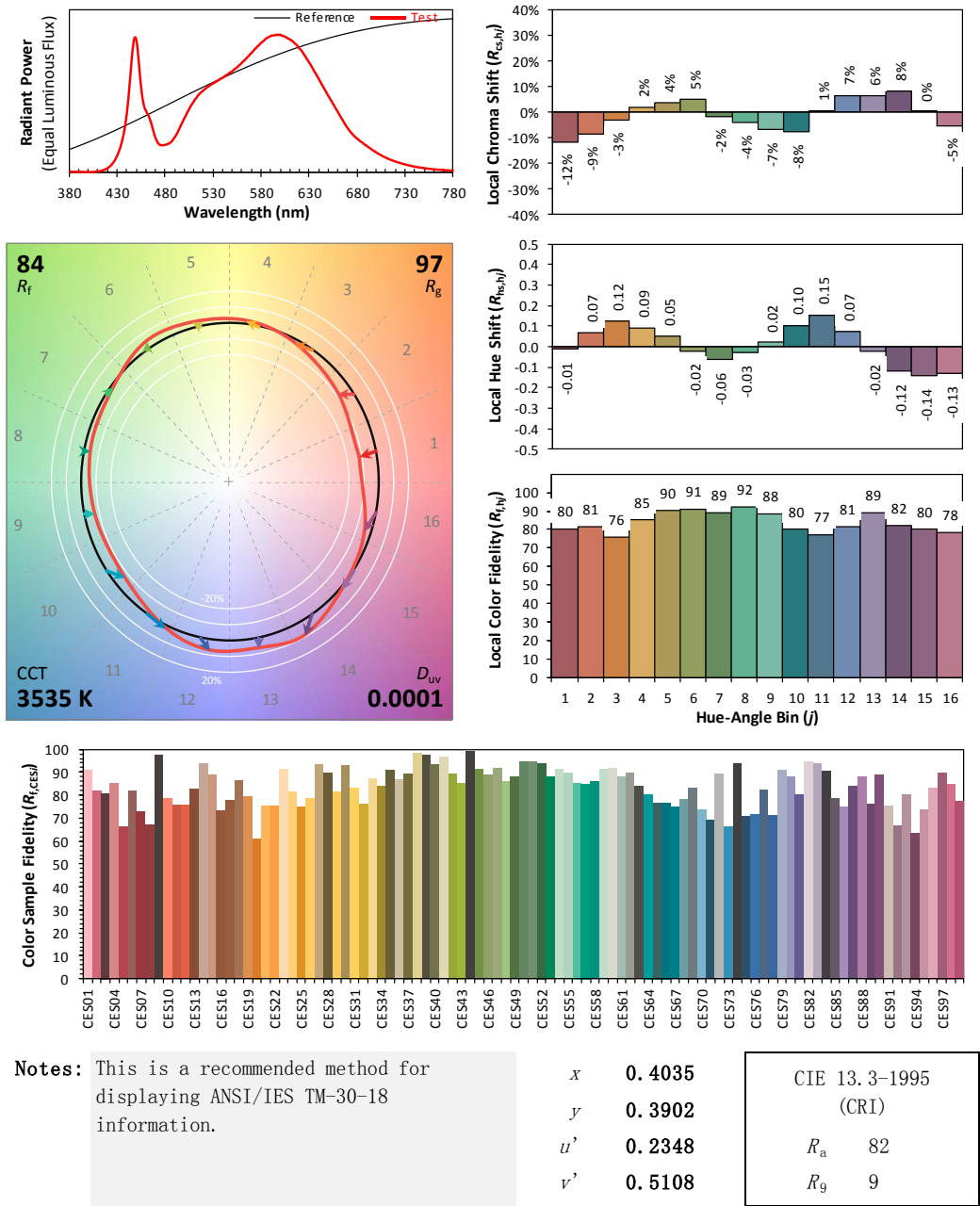
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: Industrial Lighting Products, LLC

Date: 2025/03/18

Model: ULB2-20L-U-35-L2



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	113.433	4.13%
10- 20	322.804	11.77%
20- 30	478.315	17.44%
30- 40	545.129	19.87%
40- 50	500.979	18.26%
50- 60	371.518	13.54%
60- 70	223.821	8.16%
70- 80	131.706	4.80%
80- 90	43.653	1.59%
90-100	0.933	0.03%
100-110	1.449	0.05%
110-120	1.984	0.07%
120-130	1.966	0.07%
130-140	1.86	0.07%
140-150	1.606	0.06%
150-160	1.248	0.05%
160-170	0.76	0.03%
170-180	0.23	0.01%
Total	2743.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	2332.178	85.01%
60- 90	399.18	14.55%
0-90	2731.358	99.56%
90- 180	12.036	0.44%
0- 180	2743.4	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

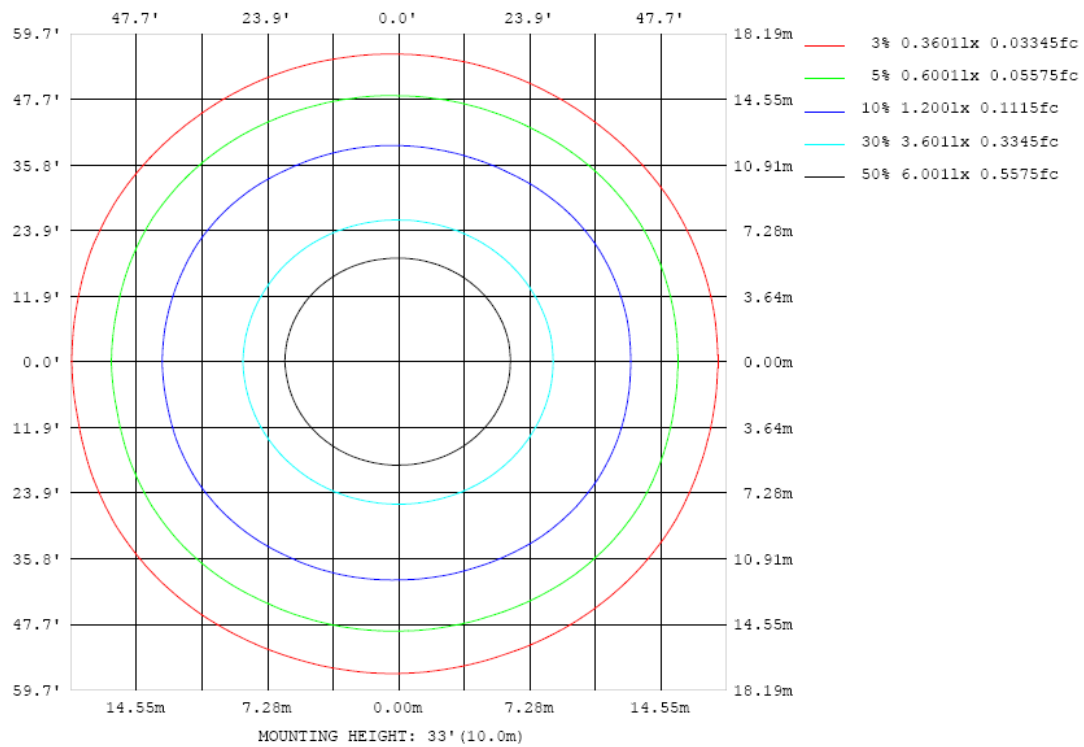


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

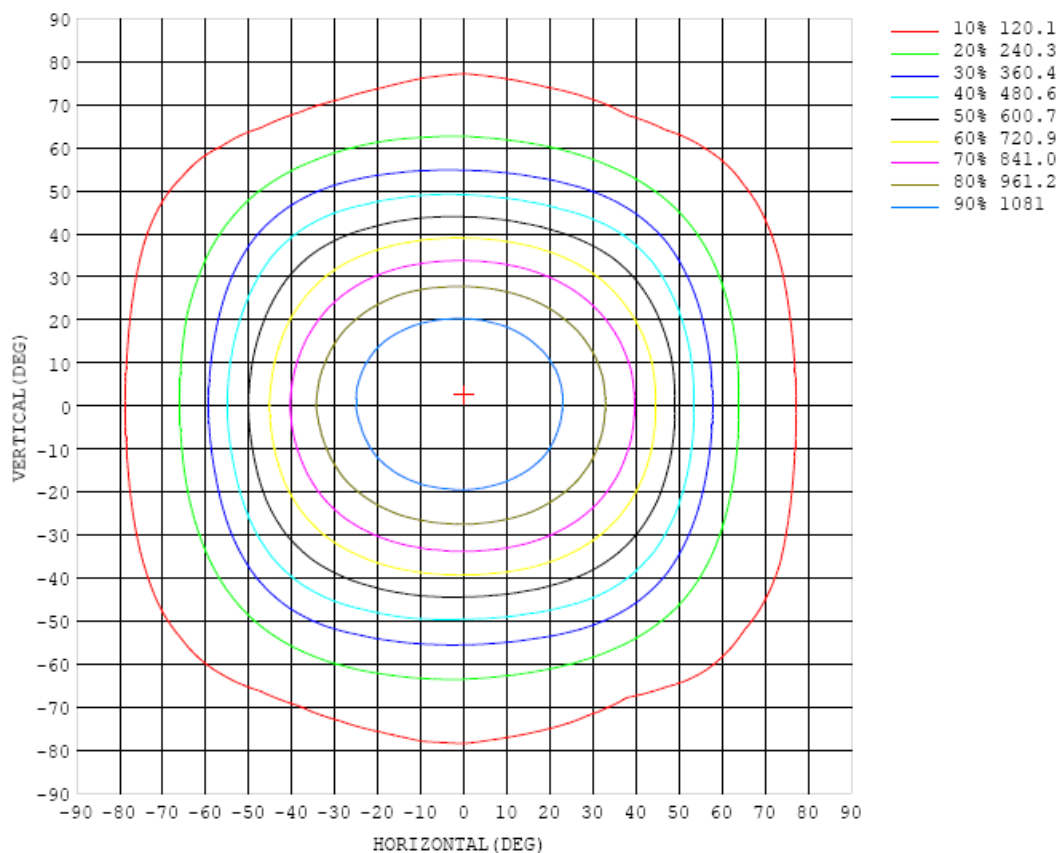


Chart 6: Isocandela Plot

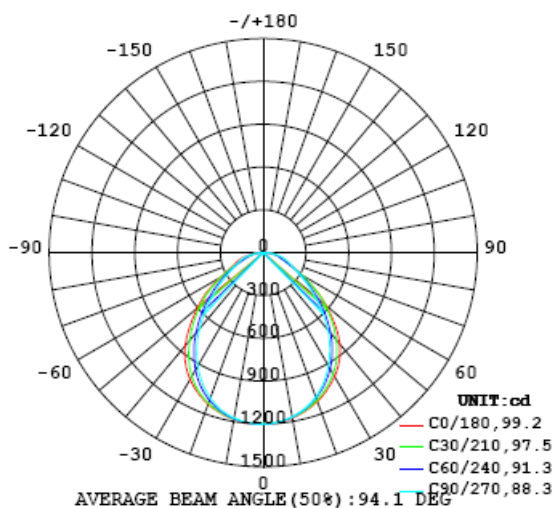


Chart 7: Polar Candela Distribution

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	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
5	1193	1191	1194	1191	1192	1191	1193	1193	1190	1191	1190	1191	1194	1193	1196	1196	1197	1193	1198
10	1175	1174	1173	1170	1172	1170	1169	1169	1169	1167	1168	1169	1173	1176	1178	1181	1182	1181	1186
15	1148	1145	1147	1141	1139	1136	1134	1133	1129	1130	1132	1133	1140	1143	1149	1152	1156	1158	1163
20	1110	1107	1105	1099	1096	1088	1082	1078	1075	1075	1075	1082	1090	1099	1106	1116	1121	1121	1130
25	1059	1056	1054	1046	1038	1028	1016	1010	1004	1001	1006	1012	1024	1037	1049	1061	1069	1076	1082
30	1001	998	992	980	966	951	939	927	918	916	920	930	943	960	977	995	1009	1014	1026
35	928	924	915	899	881	860	843	830	820	816	818	830	846	865	887	909	925	936	950
40	835	830	817	796	777	755	735	719	708	704	710	721	740	760	784	806	825	840	851
45	710	708	699	683	664	641	617	599	588	586	595	609	628	651	675	696	713	718	727
50	577	578	577	565	548	526	500	482	474	471	481	496	514	541	566	586	596	596	603
55	435	438	442	439	428	410	391	376	369	369	376	386	401	428	450	466	472	472	482
60	313	312	313	314	309	300	291	284	283	285	289	295	306	321	335	345	345	340	345
65	225	224	222	217	210	207	210	216	220	225	227	227	229	230	234	240	246	251	254
70	177	173	162	152	144	139	150	166	178	184	184	180	167	156	154	163	177	193	201
75	138	134	121	117	113	110	116	128	140	149	147	136	123	115	115	121	129	143	160
80	94.3	94.8	84.8	83.1	86.7	82.7	85.5	89.3	96.3	105	102	88.0	83.7	80.5	78.4	85.8	87.5	98.3	105
85	44.9	49.4	48.2	42.7	45.1	39.1	44.8	46.5	51.5	48.2	50.5	45.5	41.2	37.7	36.7	42.1	43.0	46.5	45.3
90	1.89	1.93	2.73	3.62	3.26	4.26	5.05	4.51	3.91	3.28	3.84	4.90	4.63	3.35	2.65	1.29	0.51	0.16	0.10
95	0.15	0.16	0.24	1.22	0.72	0.49	0.65	0.92	0.87	0.76	0.96	0.96	2.35	1.60	0.90	0.65	0.33	0.19	0.20
100	0.54	0.58	0.62	0.59	0.77	1.07	1.20	1.20	1.13	0.83	1.18	1.47	1.41	1.26	2.16	0.91	0.57	0.42	0.38
105	0.64	0.75	0.83	1.24	1.64	1.49	1.89	1.81	1.39	1.15	1.53	1.99	2.03	2.12	1.80	1.36	0.92	0.79	0.65
110	1.17	1.42	1.25	1.40	1.72	2.17	2.19	2.19	1.66	1.59	1.93	2.01	2.52	2.53	2.23	1.98	1.64	1.51	1.26
115	0.80	1.10	1.22	1.82	2.18	2.36	2.45	2.15	1.93	2.08	2.30	2.35	2.83	2.67	2.62	2.21	2.05	2.05	1.99
120	1.77	1.30	1.75	1.83	1.87	2.40	2.50	2.17	2.14	2.49	2.61	2.58	2.65	3.27	2.51	2.35	2.00	1.84	1.35
125	1.63	1.53	1.87	1.77	2.09	2.34	2.17	2.27	2.45	2.72	2.78	2.81	2.77	2.75	3.07	2.54	2.42	2.23	2.43
130	1.86	1.45	2.04	2.01	2.39	2.13	2.06	2.12	2.38	2.80	2.76	2.77	2.72	2.76	3.04	2.82	2.85	2.29	2.30
135	2.08	1.58	2.40	2.32	1.93	2.21	2.26	2.59	2.80	3.04	2.97	3.06	2.90	2.77	2.45	2.99	3.11	2.41	2.84
140	2.31	1.78	2.44	2.15	2.07	1.90	2.33	2.82	2.93	3.19	2.95	3.11	2.94	2.63	2.65	2.64	2.65	1.61	2.52
145	2.14	2.12	1.98	2.14	2.17	2.41	2.62	2.66	2.88	3.34	3.05	2.82	2.95	2.92	2.77	2.55	2.48	1.73	2.61
150	1.91	1.90	1.49	2.39	2.65	2.79	2.78	2.76	3.01	3.27	3.42	3.22	3.07	2.85	2.38	2.37	2.06	2.09	2.58
155	2.54	2.75	2.00	2.27	2.89	2.96	2.80	2.93	3.19	3.22	3.39	3.24	3.09	2.92	2.88	2.72	1.95	2.40	2.86
160	2.88	3.04	2.33	1.88	2.48	2.84	2.94	3.04	3.21	3.18	3.29	3.25	3.39	3.37	3.30	2.59	2.21	2.91	2.91
165	2.75	2.86	2.66	2.05	1.83	2.22	2.55	2.86	3.12	3.28	3.35	2.99	3.11	2.91	2.27	2.26	2.49	3.16	3.17
170	2.73	2.77	2.84	2.66	2.16	1.89	1.76	1.77	1.93	1.98	1.95	1.84	1.84	2.09	2.20	2.66	3.22	3.29	3.25
175	2.02	2.13	2.19	2.12	2.07	2.02	2.02	2.02	1.91	1.89	1.96	2.37	2.49	2.78	3.13	3.33	3.35	3.28	3.01
180	2.24	2.30	2.14	2.30	2.15	2.22	2.28	2.33	2.35	2.49	2.46	2.09	2.13	2.61	2.44	2.33	1.80	3.34	2.31

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	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200		
5	1196	1198	1195	1199	1196	1197	1198	1197	1193	1194	1194	1195	1195	1195	1195	1194	1191		
10	1186	1187	1185	1184	1182	1181	1178	1177	1177	1175	1175	1175	1177	1176	1177	1178	1176		
15	1162	1161	1159	1157	1152	1149	1146	1141	1139	1140	1139	1143	1144	1147	1149	1149	1148		
20	1130	1128	1122	1118	1108	1101	1093	1088	1083	1084	1085	1091	1096	1101	1107	1109	1108		
25	1082	1080	1071	1061	1047	1034	1024	1013	1009	1008	1014	1022	1033	1042	1051	1059	1061		
30	1022	1015	1000	986	965	949	934	922	916	920	924	938	951	968	984	995	1001		
35	943	932	911	890	867	847	831	818	812	814	824	838	856	875	897	916	927		
40	841	826	803	782	757	734	715	701	695	698	707	723	746	770	792	815	831		
45	718	708	689	671	644	616	599	584	573	574	580	598	622	651	674	695	711		
50	598	590	577	557	530	500	481	468	458	455	462	475	503	532	554	568	579		
55	476	467	459	440	416	392	374	362	355	354	357	369	388	408	425	435	440		
60	343	346	338	323	307	295	285	277	272	270	271	273	278	290	303	308	313		
65	256	247	231	218	212	213	217	216	215	211	205	199	194	195	205	219	226		
70	198	174	155	143	142	153	166	176	178	171	160	149	136	136	145	157	172		
75	147	126	113	109	108	108	118	133	141	131	119	113	108	110	113	118	130		
80	98.3	83.8	77.5	68.7	66.8	70.5	71.4	86.2	88.4	85.7	78.5	79.0	75.9	79.5	80.5	80.8	91.6		
85	45.8	38.2	32.7	31.2	25.7	27.0	27.9	33.4	31.2	35.3	33.7	35.4	31.8	36.6	37.6	43.7	50.5		
90	0.09	0.20	0.34	0.54	1.46	3.73	1.77	0.64	0.59	0.67	2.42	1.22	1.58	0.95	1.30	0.88	0.58		
95	0.20	0.31	0.47	0.59	0.69	0.86	0.81	0.84	0.52	0.92	0.72	0.76	0.54	0.52	0.43	0.31	0.20		
100	0.43	0.55	0.71	0.94	1.23	1.47	1.68	1.03	0.77	1.07	1.35	1.39	1.34	1.11	0.87	0.67	0.61		
105	0.76	0.89	1.15	1.48	1.84	2.28	2.09	1.36	1.01	1.21	1.97	1.86	1.41	1.28	1.01	0.72	0.79		
110	1.40	1.64	1.93	2.24	2.52	2.42	1.80	1.60	1.28	1.40	1.75	2.24	2.12	1.68	1.57	1.10	1.38		
115	1.95	2.33	2.27	2.44	2.38	2.13	1.88	1.78	1.54	1.56	1.77	1.97	2.09	2.13	1.83	1.57	1.43		
120	1.81	2.37	2.05	2.03	2.21	2.32	2.13	1.98	1.91	1.84	1.96	2.00	1.96	1.77	1.90	2.05	1.82		
125	2.26	2.47	2.22	1.98	2.30	2.14	2.17	2.17	2.28	2.07	1.97	2.14	1.94	1.94	1.86	1.71	1.60		
130	1.98	2.56	2.49	2.57	2.02	2.22	2.21	2.18	2.42	2.08	1.94	2.05	2.05	2.02	1.89	1.95	1.64		
135	2.50	2.20	2.74	2.58	2.57	2.22	2.21	2.67	2.81	2.51	2.15	2.12	2.14	1.94	2.31	2.14	1.83		
140	2.21	2.65	2.65	2.67	2.49	2.86	2.64	2.31	2.29	2.23	2.34	2.62	2.16	2.23	2.31	2.31	2.14		
145	2.51	2.47	2.35	2.81	3.01	3.04	2.92	3.10	2.21	2.70	2.61	2.56	2.57	2.39	2.08	2.30	2.26		
150	2.61	2.34	2.95	2.38	3.10	3.22	3.22	3.41	2.27	2.28	2.61	2.68	2.87	2.44	2.39	2.02	1.95		
155	2.91	2.74	2.61	3.18	2.41	2.73	3.31	3.44	2.46	2.64	2.38	2.29	2.23	2.40	2.67	2.48	2.71		
160	3.00	2.98	2.57	2.66	3.08	3.01	2.48	2.29	2.20	2.33	2.34	2.42	2.38	2.21	2.24	2.81	3.09		
165	3.13	3.22	3.03	3.04	2.71	2.19	2.45	3.08	2.66	2.32	2.78	2.32	2.05	2.06	2.53	2.72	2.59		
170	3.23	3.24	3.25	2.97	2.65	2.48	2.65	2.80	2.04	1.94	2.01	1.97	1.94	2.00	2.02	2.13	2.25		
175	3.04	2.96	2.90	2.86	2.83	2.87	2.79	2.13	1.99	1.99	1.96	2.02	2.04	2.04	2.06	2.11	2.25		
180	2.36	2.37	2.33	2.34	2.33	2.30	2.31	2.24	2.34	2.41	2.38	2.24	2.30	2.27	2.30	2.26	2.24		

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 ***

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement.