LM-79-19 TEST REPORT

for

RAB LIGHTING INC

408 W 14th St New York, NY 10014 United States

LED Lamp

Model: FHID-45S-EX39-850

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ25040039c

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

Review by: Wei Fei

Engineer: Wei Fei
May 14, 2025

Approve by:

Manager: April Zou
May 14, 2025

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

TEST SUMMARY

Tested Model	FHID-45S-EX39-850 Lamp in Lithonia KAD Contour Series (Mogul Socket Version)	FHID-45S-EX39-850
Luminous Efficacy (Lumens /Watt)	126.9	197.9
Total Luminous Flux (Lumens)	5564.5	8723.2
Power (Watts)	43.84	44.07
Power Factor	0.9892	0.9904
CCT (K)	4764	4839
CRI	82.3	82.9
Stabilization Time (Light & Power)	50 mins	50 mins
Note	5000K	5000K

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. 29, 2024

Date of Test : Apr. 07, 2024 & Apr. 16, 2024

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 for the 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

SAMPLE PHOTO

Figure 1- Overview of the sample

Sample in Lithonia KAD Contour Series (Mogul Socket Version)

Equipment Under Test(EUT)	
Name	: LED Lamp
Model	: FHID-45S-EX39-850
Electrical Ratings	: 120-277V, 50/60Hz, Field-Adjustable 45/38/30W
Product Description	: 5000K

TEST RESULTS (Lamp in Lithonia KAD Contour Series (Mogul Socket Version))

Test ambient temperature was 26.0 ℃.

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)	0.369	0.174
Power Factor	0.9892	0.8838
Test Power (W)	43.84	42.73
THD A%	9.58	9.64
Luminous Efficacy (lm/W)	126.9	128.3
Total Luminous Flux (lm)	5564.5	5484.3
Color Rendering Index (CRI)	82.3	
R9	7.1	
Correlated Color Temperature (CCT)(K)	4764	
Chromaticity Chroma x	0.3526	
Chromaticity Chroma y	0.3617	
Chromaticity Chroma u	0.2125	
Chromaticity Chroma v	0.3271	
Duv	0.0021	
Chromaticity Chroma u ’	0.2125	
Chromaticity Chroma v’	0.4906	

Special Color Rendering Indices	
R1	80.2
R2	88.2
R3	93.2
R4	80.2
R5	79.9
R6	82.7
R7	87.3
R8	66.4
R9	7.1
R10	71
R11	78.1
R12	56.3
R13	82.3
R14	96.3

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 25.1 ℃.

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)	0.369
Power Factor	0.9898
Power (W)	43.82
Luminous Efficacy (lm/W)	127.2
Total Luminous Flux (lm)	5571.6
Beam Angle (°)	110.4 (0^o-180^o) / 140.5 (90^o-270^o)
Center Beam Candle Power (cd)	1089
Zonal Lumens in the 0 °-60 °Zone	78.53%
Zonal Lumens in the 60 °-90 °Zone	21.47%
Zonal Lumens in the 90 °-120 °Zone	0.00%
Zonal Lumens in the 120 °-180 °Zone	0.00%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

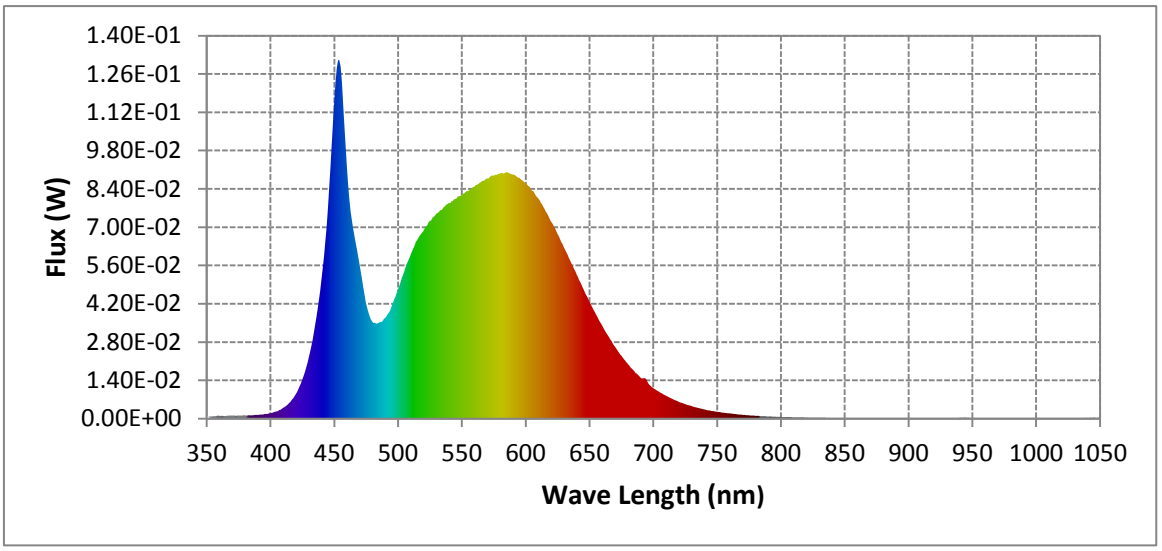
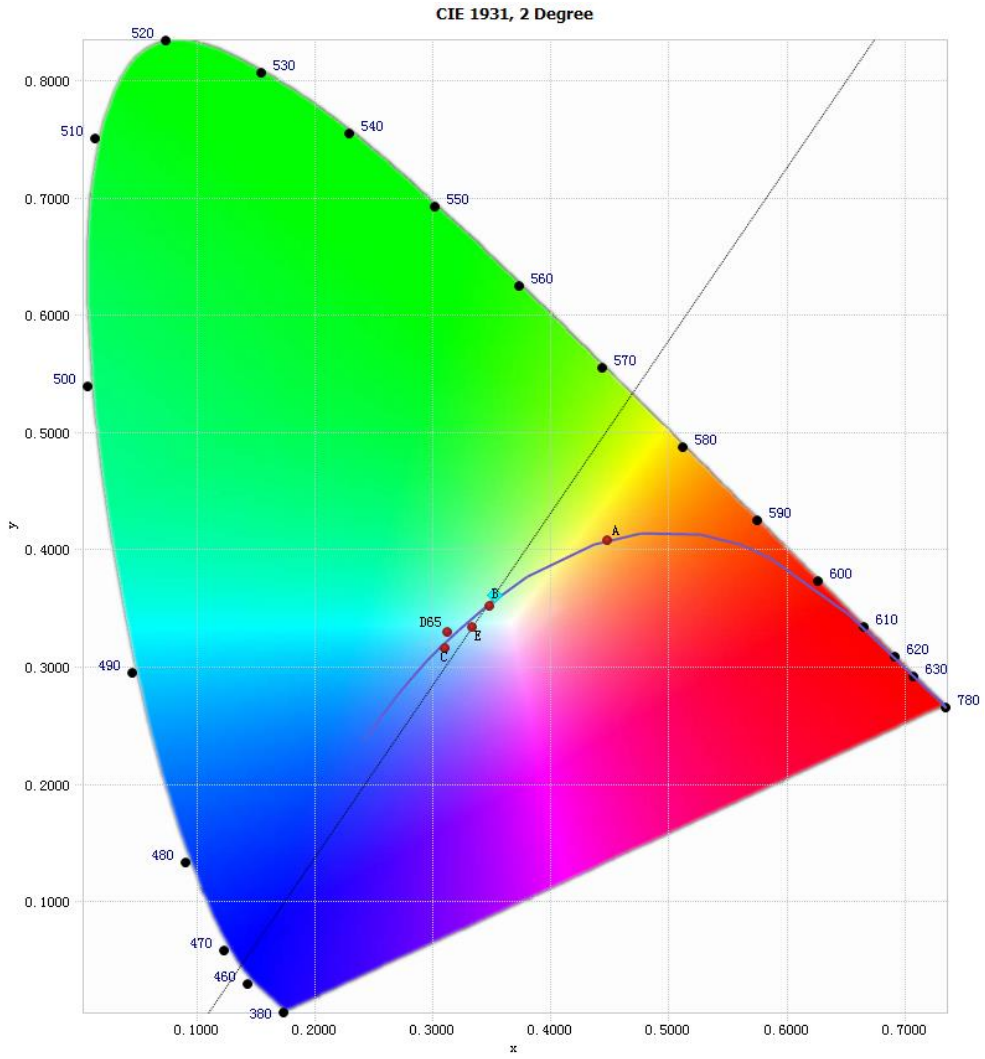


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.25E-03	485	3.51E-02	590	8.93E-02	695	1.42E-02
385	1.17E-03	490	3.68E-02	595	8.81E-02	700	1.12E-02
390	1.37E-03	495	4.10E-02	600	8.61E-02	705	9.71E-03
395	1.60E-03	500	4.73E-02	605	8.34E-02	710	8.39E-03
400	1.98E-03	505	5.39E-02	610	8.04E-02	715	7.25E-03
405	2.66E-03	510	6.00E-02	615	7.66E-02	720	6.19E-03
410	3.91E-03	515	6.53E-02	620	7.21E-02	725	5.34E-03
415	5.83E-03	520	6.86E-02	625	6.76E-02	730	4.61E-03
420	9.02E-03	525	7.23E-02	630	6.27E-02	735	3.95E-03
425	1.43E-02	530	7.50E-02	635	5.78E-02	740	3.37E-03
430	2.23E-02	535	7.67E-02	640	5.28E-02	745	2.92E-03
435	3.42E-02	540	7.88E-02	645	4.78E-02	750	2.52E-03
440	5.09E-02	545	8.04E-02	650	4.29E-02	755	2.18E-03
445	7.65E-02	550	8.16E-02	655	3.83E-02	760	1.93E-03
450	1.16E-01	555	8.32E-02	660	3.40E-02	765	1.66E-03
455	1.29E-01	560	8.48E-02	665	3.01E-02	770	1.43E-03
460	9.29E-02	565	8.64E-02	670	2.63E-02	775	1.25E-03
465	6.95E-02	570	8.78E-02	675	2.30E-02	780	1.07E-03
470	5.64E-02	575	8.88E-02	680	2.00E-02		
475	4.23E-02	580	8.96E-02	685	1.74E-02		
480	3.55E-02	585	9.01E-02	690	1.51E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3526, 0.3617)

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

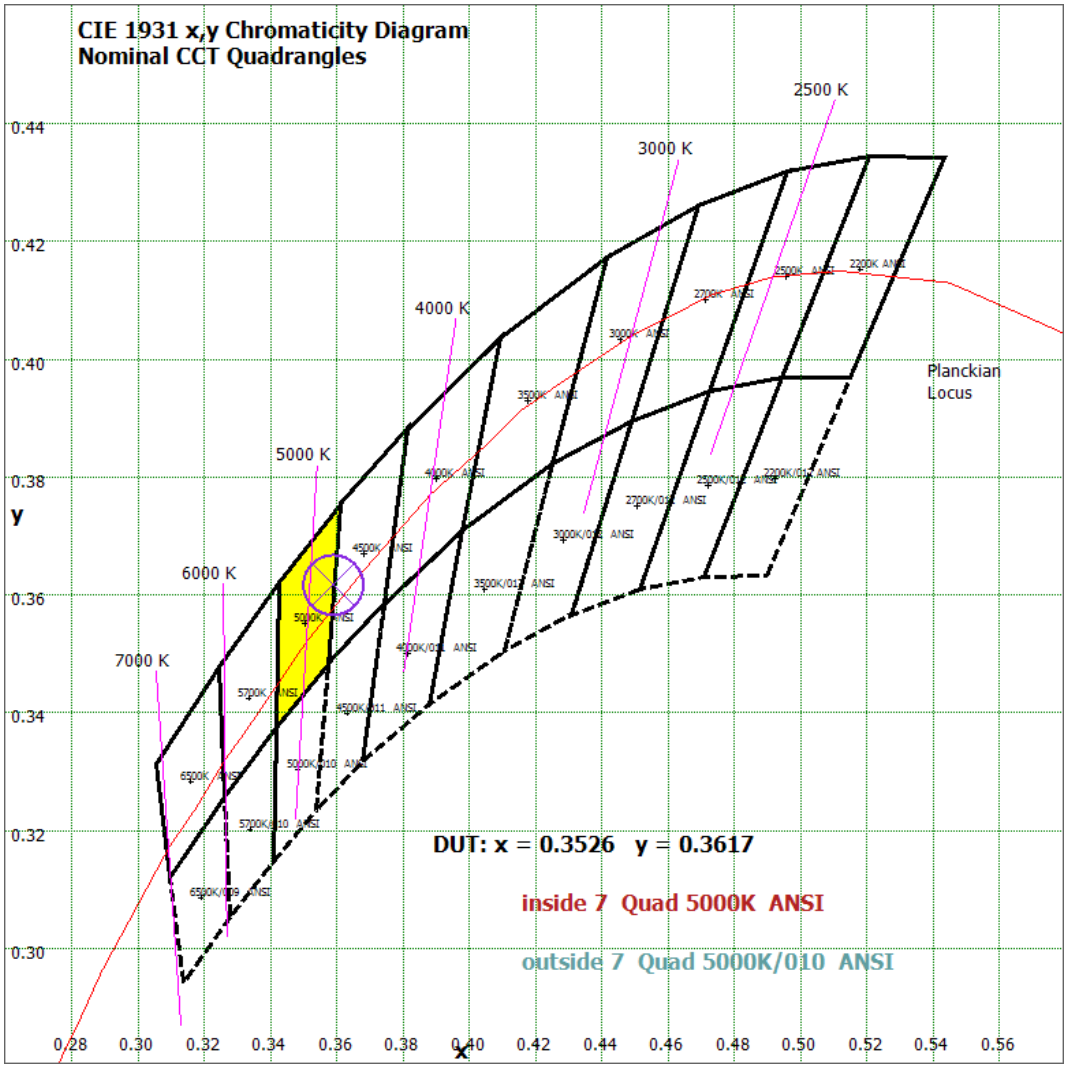


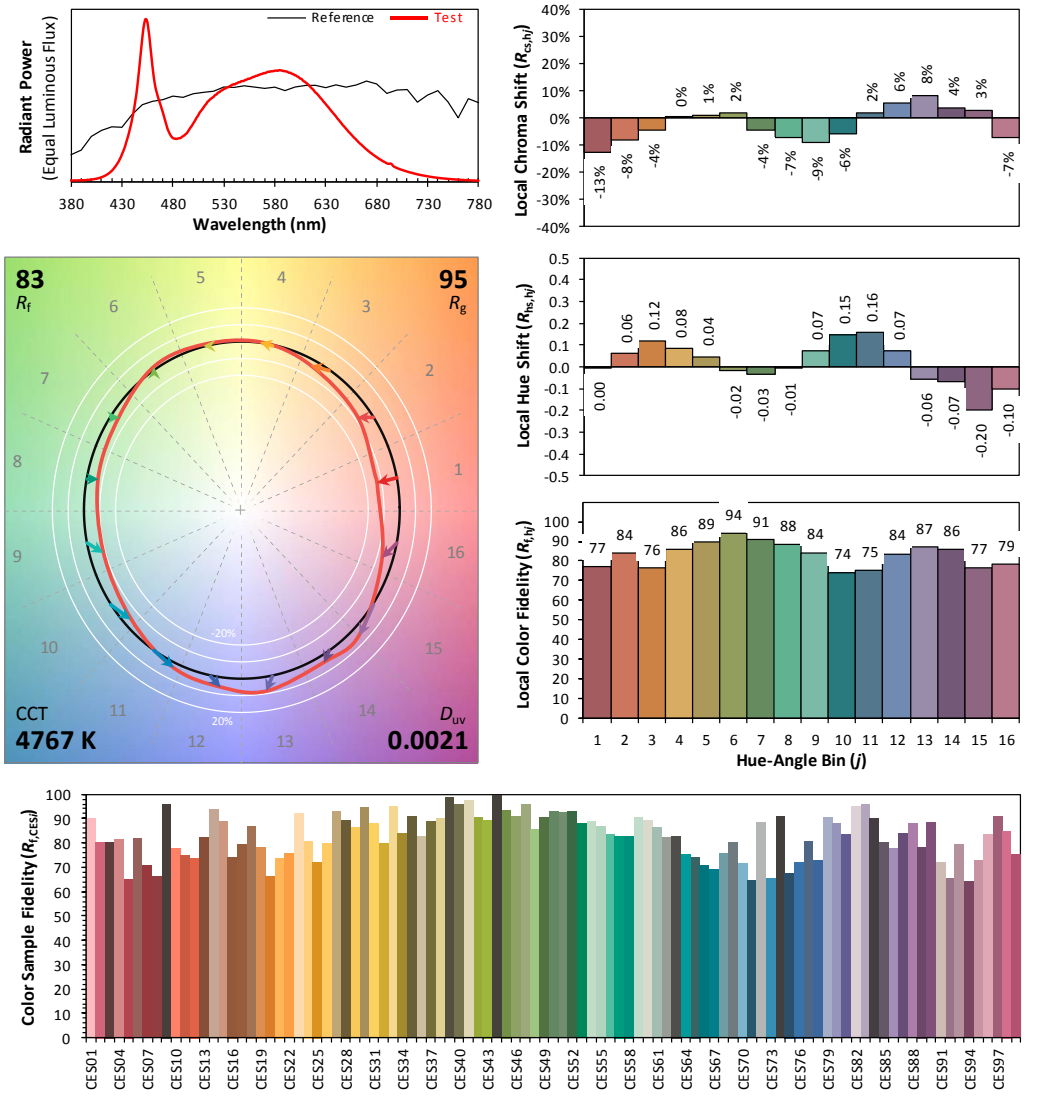
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** RAB LIGHTING INC

Date: 2024/04/16 **Model:** FHID-45S-EX39-850



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

x	0.3526
y	0.3617
u'	0.2125
v'	0.4906

CIE 13.3-1995 (CRI)

R_a	82
R_9	7

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.

IESNA Luminaire Flux Distribution Table

Zone	Lumens	Luminaire %
FL - Front-Low (0-30)	626.4	11.2
FM - Front-Medium (30-60)	2014.1	36.2
FH - Front-High (60-80)	825.4	14.8
FVH - Front-Very High (80-90)	6.7	0.1
Total Forward Light	3472.6	62.3

BL - Back-Low (0-30)	494.6	8.9
BM - Back-Medium (30-60)	1241.0	22.3
BH - Back-High (60-80)	359.8	6.5
BVH - Back-Very High (80-90)	5.1	0.1
Total Back Light	2100.5	37.8

UL - Uplight-Low (90-100)	0	0
UH - Uplight-High (100-180)	0	0
Total Up Light	0	0

BUG (Back, Up, Glare) Rating	B2-U0-G1
IES Classification	Type II
Longitudinal Classification	Short

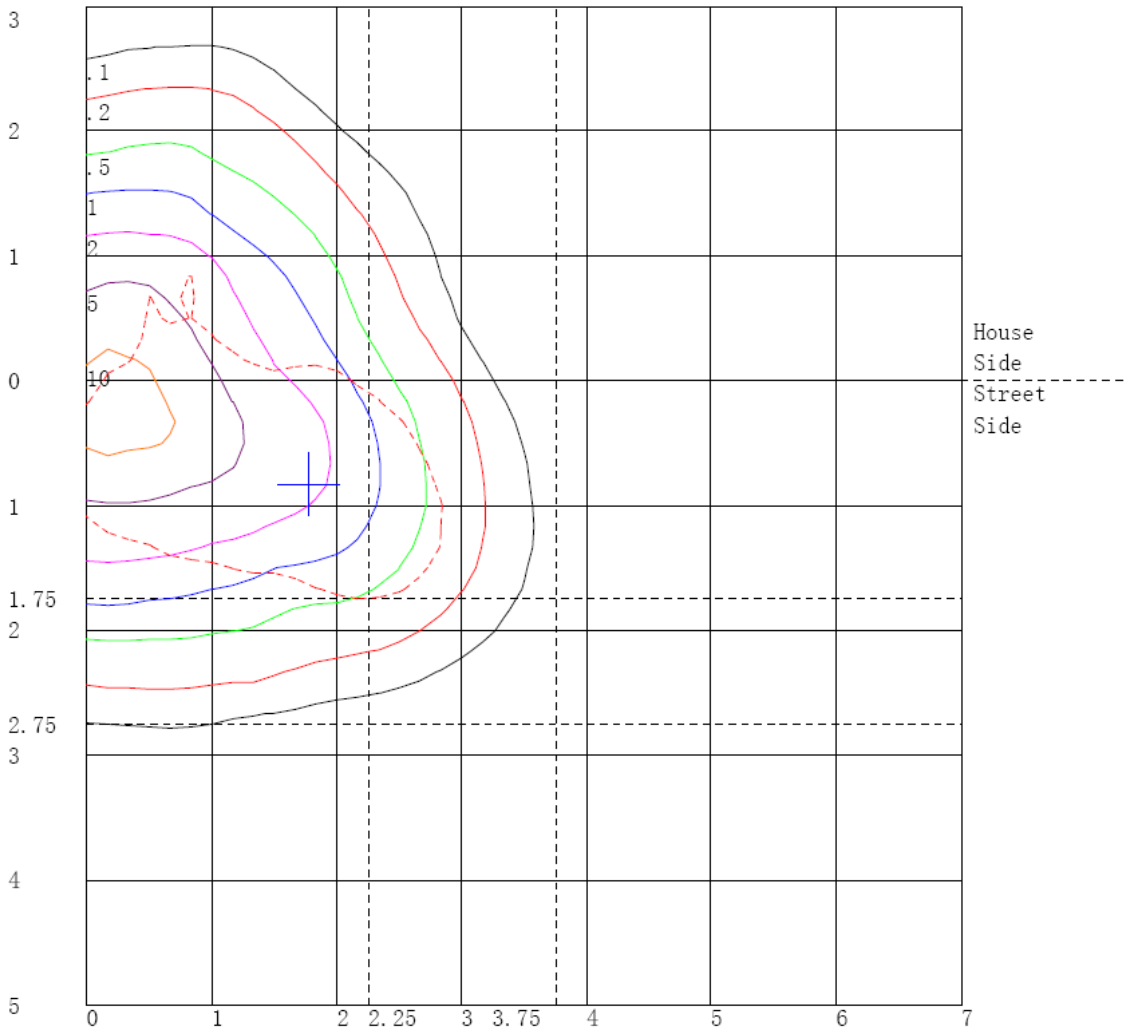
Table 5: Flux Distribution Data

Zone	Downward Lumens	Upward Lumens	Total Lumens
House Side	2100.5	0	2100.5
Street Side	3472.6	0	3472.6

Table 6: Flux Distribution Table

Note: The Flux in this table might be a little different from the total flux in Table 2 due to rounding.

Isoilluminance Plots of Horizontal Illuminance



Distance In Units Of Mounting Height

Values Based On 10 Foot Mounting Height

1/2 Maximum Candela Trace Shown As Dashed Curve

(+) = Maximum Candela Point

Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

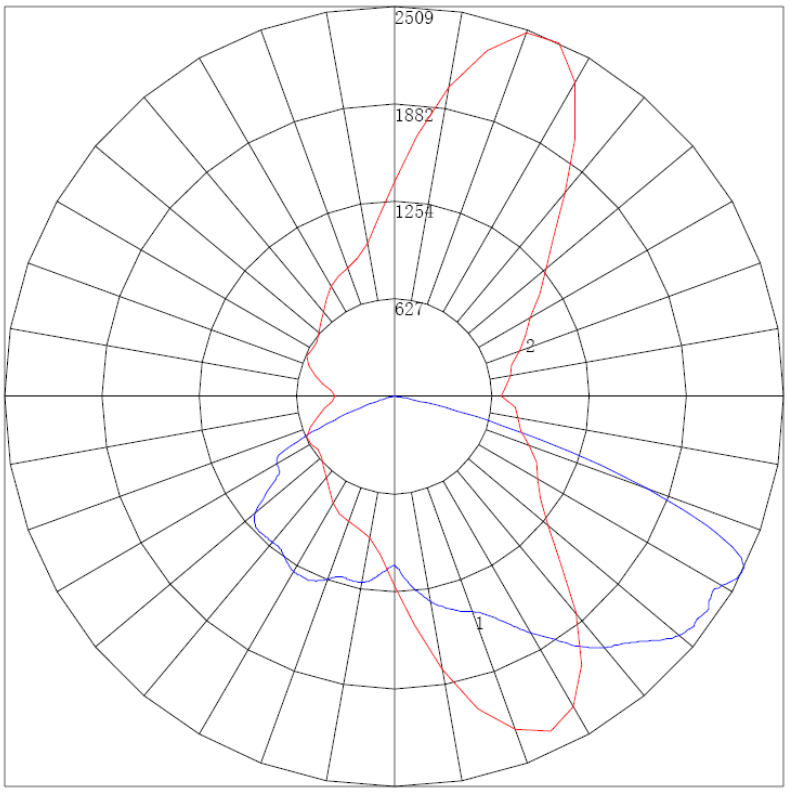
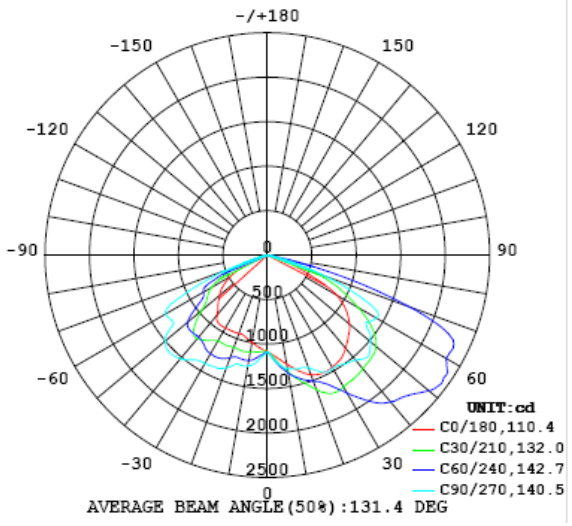


Chart 6: Maximum Plane and Cone Plots of Candela

Maximum Candela = 2508.76 Located At Horizontal Angle =65, Vertical Angle =63

1 - Vertical Plane Through Horizontal Angles (65 - 245) (Through Max. Cd.)

2 - Horizontal Cone Through Vertical Angle (63) (Through Max. Cd.)



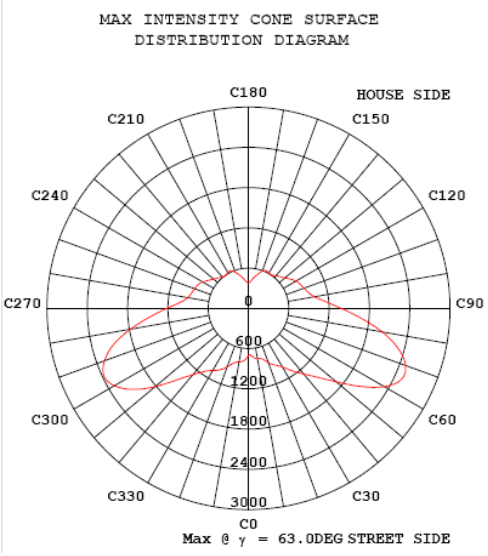


Chart 7: Polar Candela Distribution

Streetlight Coefficient of Utilization Curve

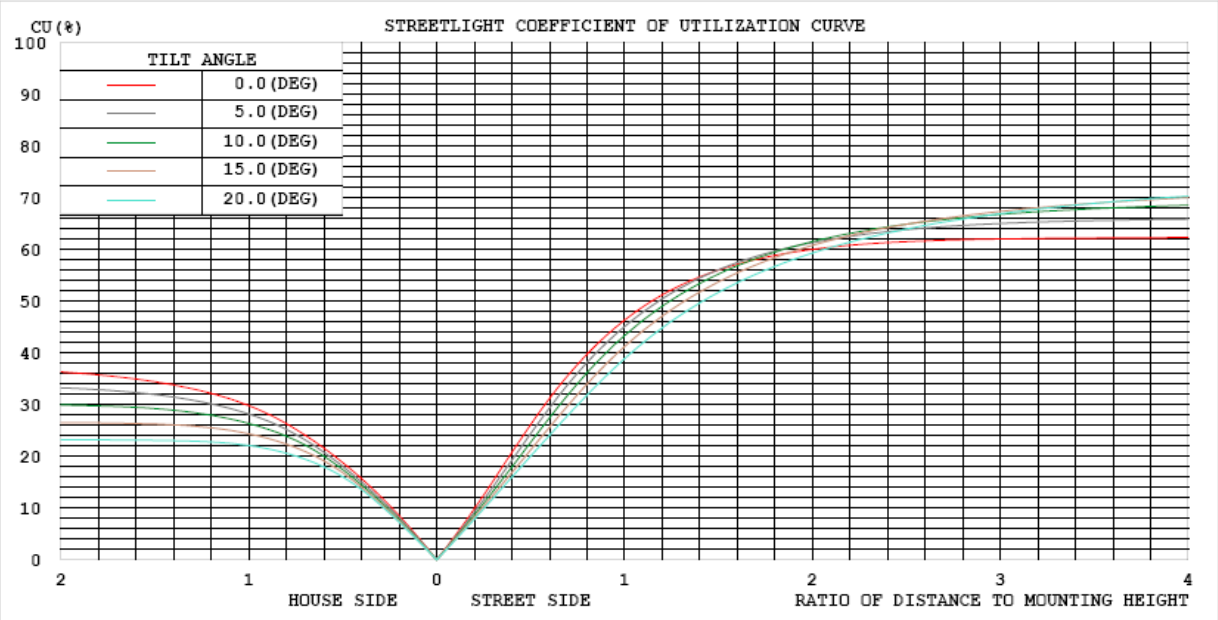


Chart 8: Coefficient of Utilization Curve

Luminous Intensity Data

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
0	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089
5	1152	1149	1155	1161	1175	1183	1194	1202	1208	1211	1219	1219	1218	1220	1219	1218	1220	1218	1214
10	1241	1242	1260	1283	1307	1317	1330	1339	1344	1345	1350	1348	1346	1339	1334	1325	1315	1305	1296
15	1347	1348	1375	1407	1429	1452	1465	1477	1483	1481	1471	1454	1439	1418	1396	1380	1360	1340	1322
20	1430	1436	1476	1511	1547	1579	1609	1615	1603	1580	1563	1537	1506	1473	1442	1414	1390	1373	1347
25	1463	1480	1533	1589	1649	1700	1716	1706	1683	1653	1638	1615	1605	1586	1560	1532	1504	1475	1448
30	1459	1482	1552	1629	1695	1717	1715	1713	1723	1754	1787	1799	1788	1754	1701	1633	1568	1515	1470
35	1430	1461	1542	1607	1643	1661	1694	1755	1845	1928	2001	2026	2005	1941	1857	1755	1656	1568	1500
40	1368	1409	1483	1536	1572	1610	1670	1773	1878	1989	2099	2152	2156	2110	2021	1897	1766	1647	1540
45	1290	1331	1406	1461	1502	1554	1645	1733	1840	1952	2070	2170	2233	2231	2176	2055	1900	1744	1605
50	1204	1241	1299	1346	1402	1496	1594	1679	1756	1879	2076	2252	2370	2393	2317	2148	1929	1695	1509
55	1083	1114	1154	1162	1219	1338	1446	1519	1618	1844	2115	2318	2418	2436	2355	2147	1874	1589	1355
60	899	932	955	938	1000	1100	1180	1275	1450	1680	1936	2146	2325	2432	2422	2276	2010	1695	1418
65	533	568	602	643	734	803	901	1041	1127	1278	1585	1971	2310	2464	2392	2164	1866	1529	1223
70	240	255	282	326	357	391	516	598	668	865	1206	1510	1697	1723	1596	1369	1161	922	701
75	62.4	66.3	82.8	99.3	113	127	148	193	274	371	490	606	694	704	641	533	427	321	228
80	15.3	15.5	16.4	16.7	17.2	18.2	19.5	30.1	43.7	47.3	56.2	78.8	106	118	113	96.7	82.2	73.1	60.0
85	5.21	5.35	5.72	5.91	5.89	6.12	6.32	6.55	6.66	7.28	8.01	9.01	10.5	11.9	12.3	12.1	11.5	10.5	9.51
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 7: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	95	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185
0	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089
5	1208	1202	1195	1185	1178	1169	1159	1154	1139	1128	1115	1102	1084	1072	1059	1048	1040	1043	1043
10	1285	1274	1264	1251	1239	1228	1207	1197	1177	1162	1147	1127	1107	1083	1057	1029	1003	1001	1004
15	1306	1286	1271	1260	1243	1227	1214	1204	1181	1170	1152	1128	1101	1077	1046	1010	966	954	962
20	1325	1306	1288	1265	1245	1230	1203	1190	1166	1151	1132	1121	1108	1080	1052	1015	967	936	953
25	1424	1396	1373	1349	1320	1285	1240	1204	1171	1150	1142	1131	1116	1097	1072	1037	981	945	968
30	1429	1405	1388	1367	1348	1328	1304	1282	1249	1206	1167	1136	1121	1107	1082	1048	993	947	978
35	1447	1404	1369	1336	1306	1283	1273	1280	1271	1263	1237	1194	1144	1111	1094	1059	999	944	985
40	1459	1390	1342	1299	1266	1256	1242	1240	1243	1251	1256	1247	1190	1106	1046	1008	941	882	926
45	1490	1398	1330	1283	1262	1254	1254	1266	1251	1224	1194	1162	1114	1032	937	895	847	786	829
50	1364	1265	1193	1153	1133	1144	1183	1236	1255	1223	1139	1010	934	886	814	762	742	700	732
55	1188	1073	1005	969	943	926	934	971	986	956	921	871	796	746	722	658	644	610	639
60	1206	1057	973	923	888	863	827	772	724	691	688	717	715	660	602	557	498	474	498
65	994	845	778	751	737	715	666	633	603	583	570	555	547	523	466	404	350	327	341
70	529	422	377	364	368	359	330	311	301	311	325	347	343	308	261	227	192	173	182
75	163	127	114	110	113	112	108	106	99.5	92.2	91.2	105	124	123	103	88.5	80.4	75.2	76.1
80	49.7	43.4	38.5	34.2	32.1	30.8	30.2	28.4	25.5	22.2	21.3	23.4	33.6	42.3	36.6	32.1	30.7	30.7	30.1
85	9.11	9.29	9.37	9.21	9.10	9.28	9.14	8.44	7.41	6.79	6.62	6.43	6.59	6.88	6.65	6.52	6.20	6.04	5.98
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 8: Luminous Intensity Data

Table--3 UNIT: cd

γ (DEG) \ C (DEG)	190	195	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280
0	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089
5	1049	1056	1071	1082	1094	1102	1110	1116	1130	1136	1148	1152	1164	1173	1176	1183	1188	1191	1196
10	1021	1045	1063	1082	1104	1124	1146	1162	1176	1188	1202	1214	1225	1236	1245	1258	1264	1275	1285
15	996	1023	1056	1087	1117	1133	1150	1166	1182	1190	1203	1209	1218	1229	1239	1255	1269	1284	1303
20	992	1030	1064	1088	1108	1119	1138	1151	1171	1194	1227	1254	1278	1299	1313	1332	1347	1366	1381
25	1013	1054	1085	1104	1115	1123	1139	1178	1216	1247	1276	1305	1325	1341	1351	1368	1387	1416	1447
30	1033	1074	1096	1102	1114	1156	1200	1232	1256	1263	1282	1298	1319	1338	1352	1376	1407	1448	1500
35	1048	1085	1100	1111	1170	1221	1243	1249	1255	1250	1240	1246	1270	1305	1337	1382	1438	1510	1598
40	1000	1045	1068	1153	1228	1254	1247	1221	1203	1192	1204	1224	1259	1308	1358	1429	1523	1621	1735
45	896	930	1010	1113	1170	1189	1191	1190	1205	1208	1214	1228	1259	1305	1369	1454	1552	1676	1824
50	776	809	891	938	968	1024	1117	1177	1199	1189	1170	1170	1192	1219	1275	1367	1502	1667	1868
55	665	714	759	782	825	879	925	972	974	947	930	933	953	976	1033	1142	1297	1505	1762
60	538	602	643	699	725	707	689	687	724	783	833	871	908	951	1017	1137	1321	1576	1869
65	387	443	507	544	535	548	573	587	601	633	664	690	696	708	743	835	1014	1265	1566
70	212	247	283	316	330	314	298	294	301	318	333	330	321	317	325	368	465	621	829
75	84.8	99.4	116	120	103	82.3	72.6	68.1	69.7	73.2	75.8	76.7	75.5	75.8	80.5	90.4	114	169	220
80	31.1	33.7	37.9	32.2	22.9	19.8	19.2	20.9	23.3	24.6	24.6	24.4	24.9	26.6	28.5	29.9	33.9	41.6	50.0
85	6.07	6.14	6.13	5.78	5.44	5.41	5.43	5.65	6.13	6.56	6.55	6.35	6.33	6.37	6.35	6.09	6.14	6.72	7.68
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 9: Luminous Intensity Data

Table--4 UNIT: cd

γ (DEG) \ C (DEG)	285	290	295	300	305	310	315	320	325	330	335	340	345	350	355				
0	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089				
5	1199	1200	1202	1201	1197	1197	1193	1193	1188	1189	1184	1173	1170	1162	1151				
10	1295	1304	1312	1321	1328	1333	1333	1331	1326	1319	1307	1296	1283	1270	1252				
15	1323	1343	1363	1385	1404	1428	1441	1456	1463	1465	1459	1439	1420	1397	1360				
20	1403	1424	1442	1462	1478	1502	1525	1546	1561	1575	1577	1568	1541	1507	1462				
25	1492	1534	1575	1602	1620	1647	1653	1658	1667	1658	1657	1642	1611	1562	1504				
30	1572	1634	1700	1759	1807	1832	1825	1796	1761	1733	1703	1676	1634	1572	1504				
35	1698	1800	1891	1963	2003	2014	1967	1900	1807	1729	1684	1661	1626	1558	1474				
40	1857	1976	2069	2134	2142	2108	2014	1913	1811	1698	1608	1582	1566	1509	1419				
45	1978	2115	2215	2250	2213	2122	1999	1880	1771	1680	1578	1504	1484	1442	1364				
50	2091	2282	2370	2377	2301	2176	1986	1843	1735	1647	1538	1428	1381	1348	1283				
55	2027	2258	2407	2452	2343	2193	1939	1695	1573	1507	1397	1260	1196	1208	1171				
60	2143	2309	2388	2354	2186	2012	1745	1488	1301	1242	1172	1063	987	1000	989				
65	1853	2083	2242	2221	2009	1702	1364	1130	1037	953	874	796	707	648	620				
70	1019	1223	1389	1459	1380	1191	923	706	578	518	416	364	349	316	294				
75	297	405	490	529	489	417	340	262	198	151	123	110	106	95.8	80.7				
80	56.7	68.8	76.5	76.1	62.6	46.3	34.0	30.3	22.1	19.1	17.5	17.5	17.1	17.7	17.7				
85	8.30	8.43	8.27	7.67	6.82	6.21	5.90	5.67	5.52	5.48	5.42	5.47	5.64	5.83	5.73				
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				

Table 10: Luminous Intensity Data

TEST RESULTS (Bare Lamp)

Test ambient temperature was 26.0 ℃.

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)	0.371	0.175
Power Factor	0.9904	0.8808
Test Power (W)	44.07	42.80
THD A%	9.98	12.56
Luminous Efficacy (lm/W)	197.9	199.3
Total Luminous Flux (lm)	8723.2	8531.5
Color Rendering Index (CRI)	82.9	
R9	10.7	
Correlated Color Temperature (CCT)(K)	4839	
Chromaticity Chroma x	0.3498	
Chromaticity Chroma y	0.3563	
Chromaticity Chroma u	0.2128	
Chromaticity Chroma v	0.3251	
Duv	0.0005	
Chromaticity Chroma u ’	0.2128	
Chromaticity Chroma v’	0.4876	

Special Color Rendering Indices	
R1	81.3
R2	88.7
R3	92.7
R4	81.4
R5	81
R6	82.9
R7	87.5
R8	67.8
R9	10.7
R10	71.7
R11	79.6
R12	56.9
R13	83.4
R14	96.1

Table 11: 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 25.1 ℃.

The photometric distance is 2.47 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)	0.371
Power Factor	0.9906
Power (W)	44.15
Luminous Efficacy (lm/W)	198.9
Total Luminous Flux (lm)	8779.1
Beam Angle (°)	347.6 (0^o-180^o) / 349.1 (90^o-270^o)
Center Beam Candle Power (cd)	54.1
Maximum Beam Candle Power (cd)	928.5 (At: C=0.0, Gamma=86.5)
Spacing Criteria	5.55 (0^o-180^o) / 5.51 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	20.78%
Zonal Lumens in the 60 °-90 °Zone	30.91%
Zonal Lumens in the 90 °-120 °Zone	30.34%
Zonal Lumens in the 120 °-180 °Zone	17.96%

Table 12: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

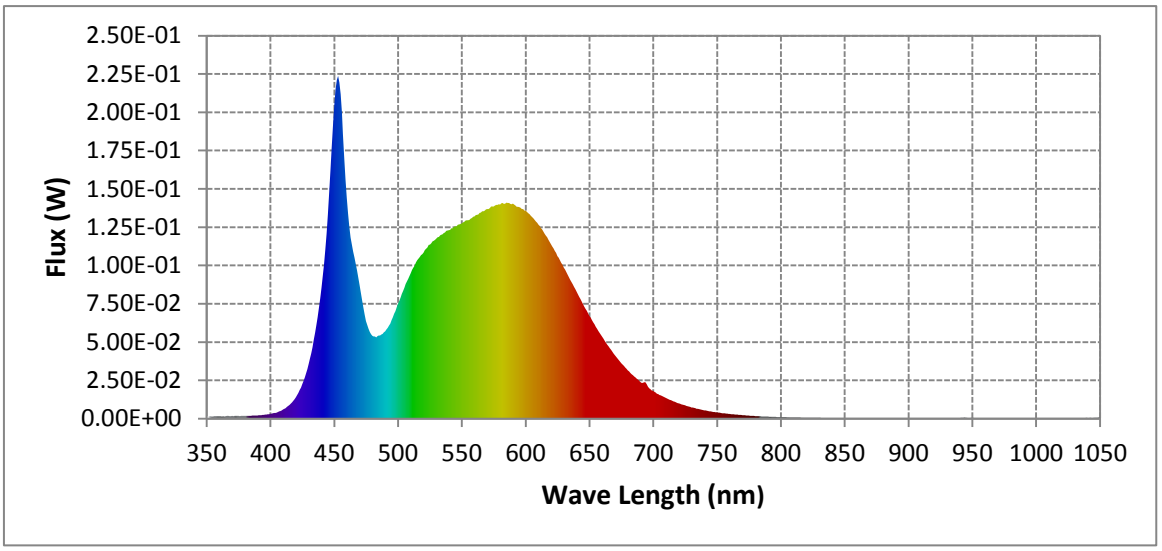
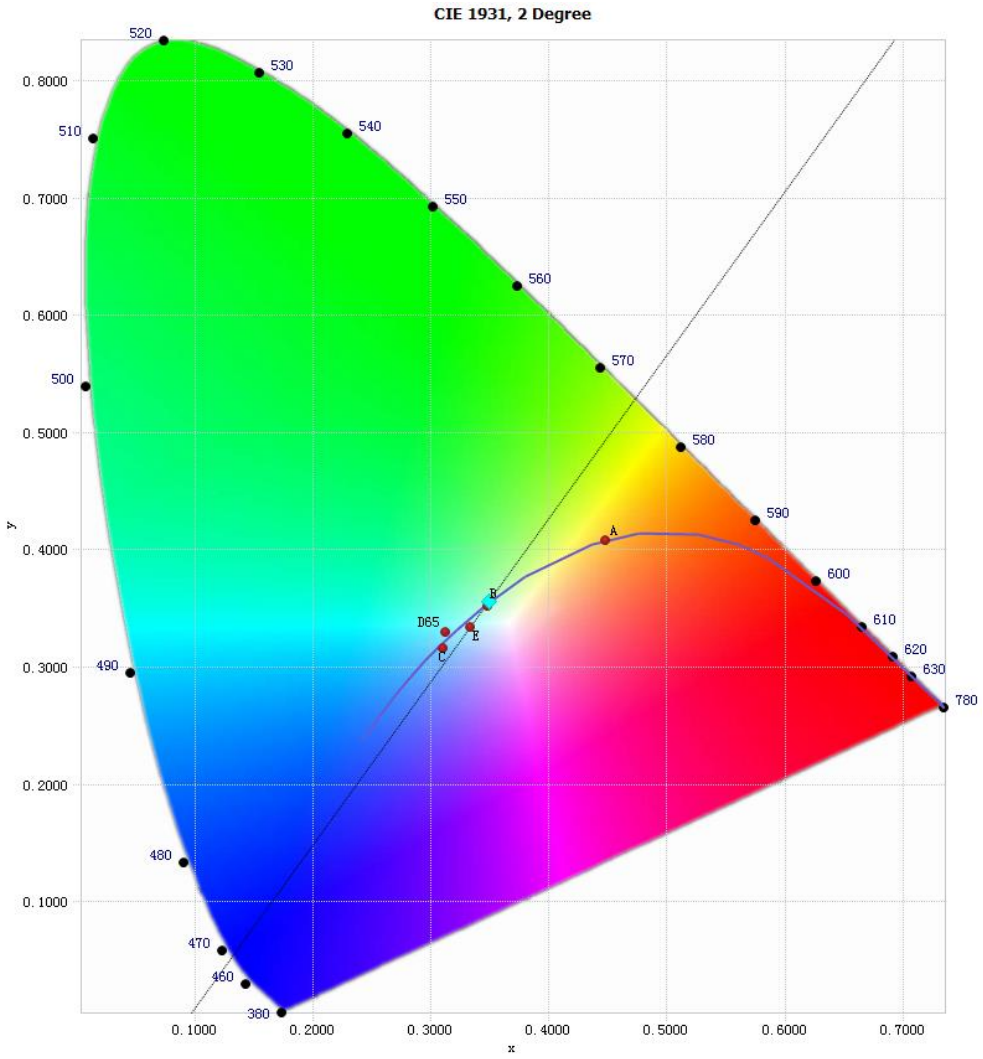


Chart 9: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.86E-03	485	5.42E-02	590	1.40E-01	695	2.26E-02
385	1.93E-03	490	5.71E-02	595	1.38E-01	700	1.81E-02
390	2.15E-03	495	6.43E-02	600	1.36E-01	705	1.55E-02
395	2.54E-03	500	7.50E-02	605	1.32E-01	710	1.35E-02
400	3.08E-03	505	8.54E-02	610	1.27E-01	715	1.17E-02
405	4.03E-03	510	9.50E-02	615	1.21E-01	720	1.00E-02
410	5.96E-03	515	1.03E-01	620	1.14E-01	725	8.67E-03
415	8.93E-03	520	1.08E-01	625	1.06E-01	730	7.39E-03
420	1.39E-02	525	1.14E-01	630	9.87E-02	735	6.42E-03
425	2.25E-02	530	1.18E-01	635	9.08E-02	740	5.49E-03
430	3.57E-02	535	1.20E-01	640	8.29E-02	745	4.73E-03
435	5.60E-02	540	1.23E-01	645	7.48E-02	750	4.11E-03
440	8.53E-02	545	1.26E-01	650	6.71E-02	755	3.55E-03
445	1.33E-01	550	1.27E-01	655	6.00E-02	760	3.09E-03
450	2.04E-01	555	1.30E-01	660	5.35E-02	765	2.68E-03
455	2.12E-01	560	1.32E-01	665	4.71E-02	770	2.31E-03
460	1.44E-01	565	1.35E-01	670	4.13E-02	775	1.99E-03
465	1.09E-01	570	1.37E-01	675	3.62E-02	780	1.74E-03
470	8.73E-02	575	1.38E-01	680	3.16E-02		
475	6.37E-02	580	1.40E-01	685	2.77E-02		
480	5.41E-02	585	1.41E-01	690	2.41E-02		

Table13: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3498, 0.3563)

Chart 10: 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

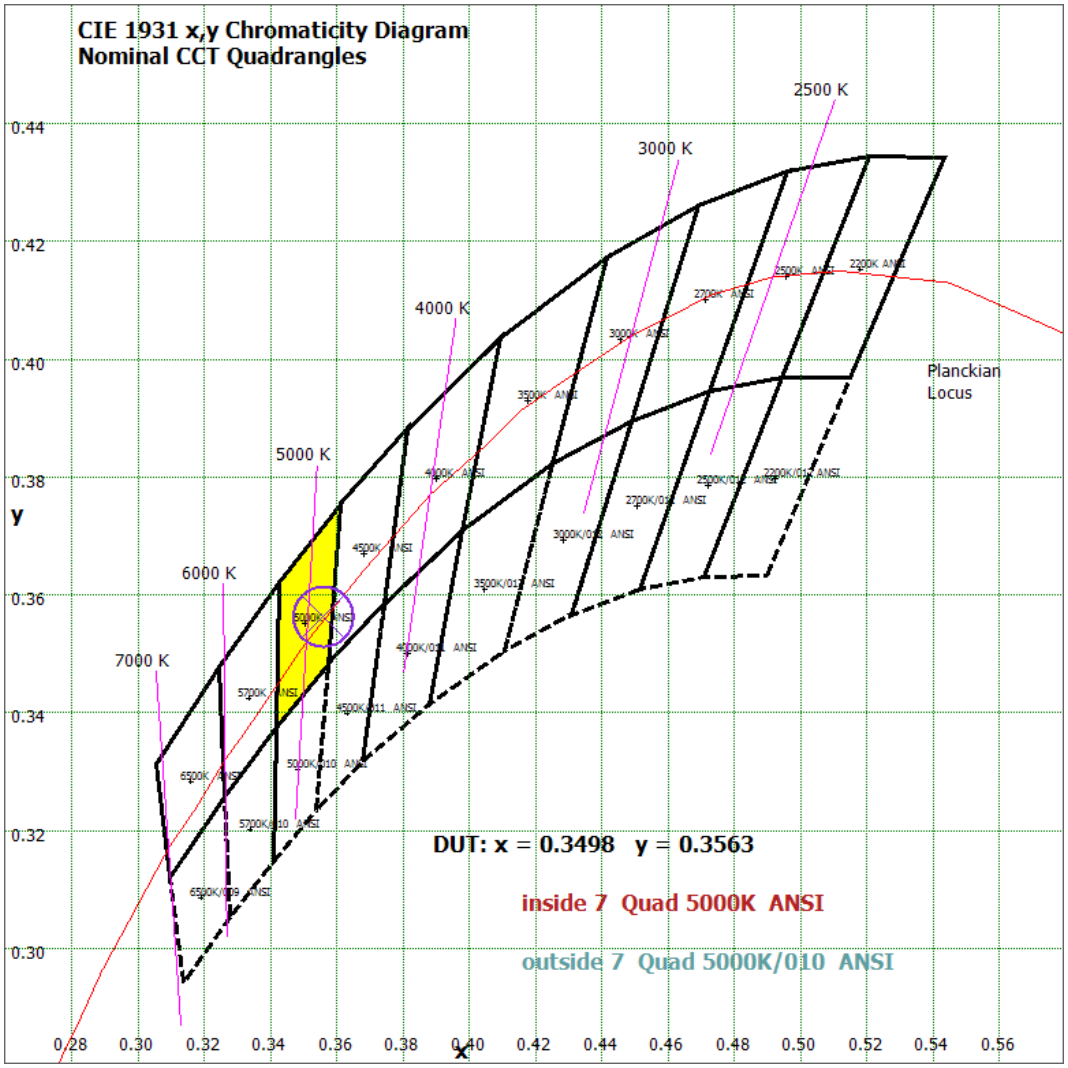


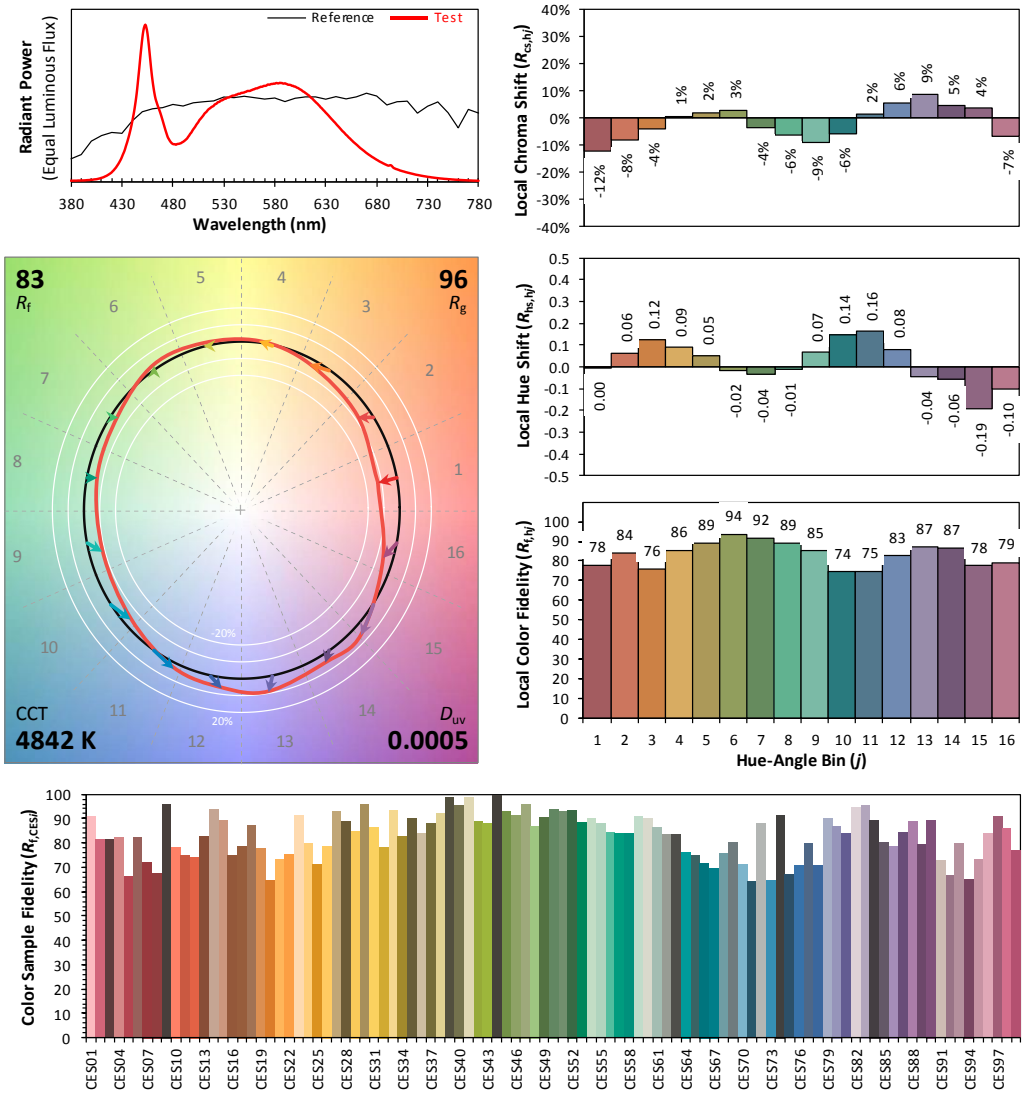
Chart 11: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** RAB LIGHTING INC

Date: 2024/04/07 **Model:** FHID-45S-EX39-850



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.	x	0.3498	CIE 13.3-1995 (CRI)
	y	0.3563	R_a 83
	u'	0.2128	R_9 11
	v'	0.4876	

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

Chart 12: 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 11 due to rounding.

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	11.219	0.13%
10- 20	72.235	0.82%
20- 30	191.366	2.18%
30- 40	346.205	3.94%
40- 50	517.976	5.90%
50- 60	685.517	7.81%
60- 70	824.467	9.39%
70- 80	920.957	10.49%
80- 90	968.542	11.03%
90-100	962.582	10.96%
100-110	904.565	10.30%
110-120	796.496	9.07%
120-130	646.843	7.37%
130-140	468.027	5.33%
140-150	285.816	3.26%
150-160	133.879	1.52%
160-170	38.97	0.44%
170-180	3.406	0.04%
Total	8779.1	100%

γ(°)	Lumens	% Total
0-130	7848.97	89.41%
130-180	930.098	10.59%
0-180	8779.1	100%

Table 14: Zonal Lumen

Illuminance Plots- Goniophotometer Method

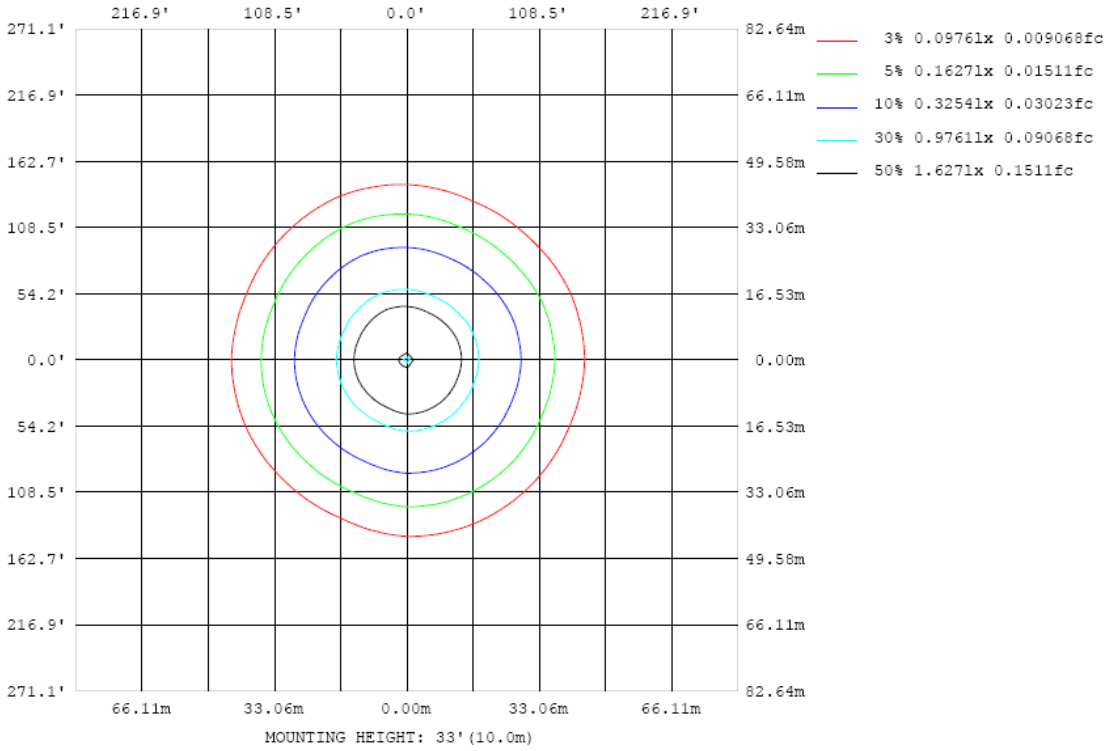


Chart 13: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

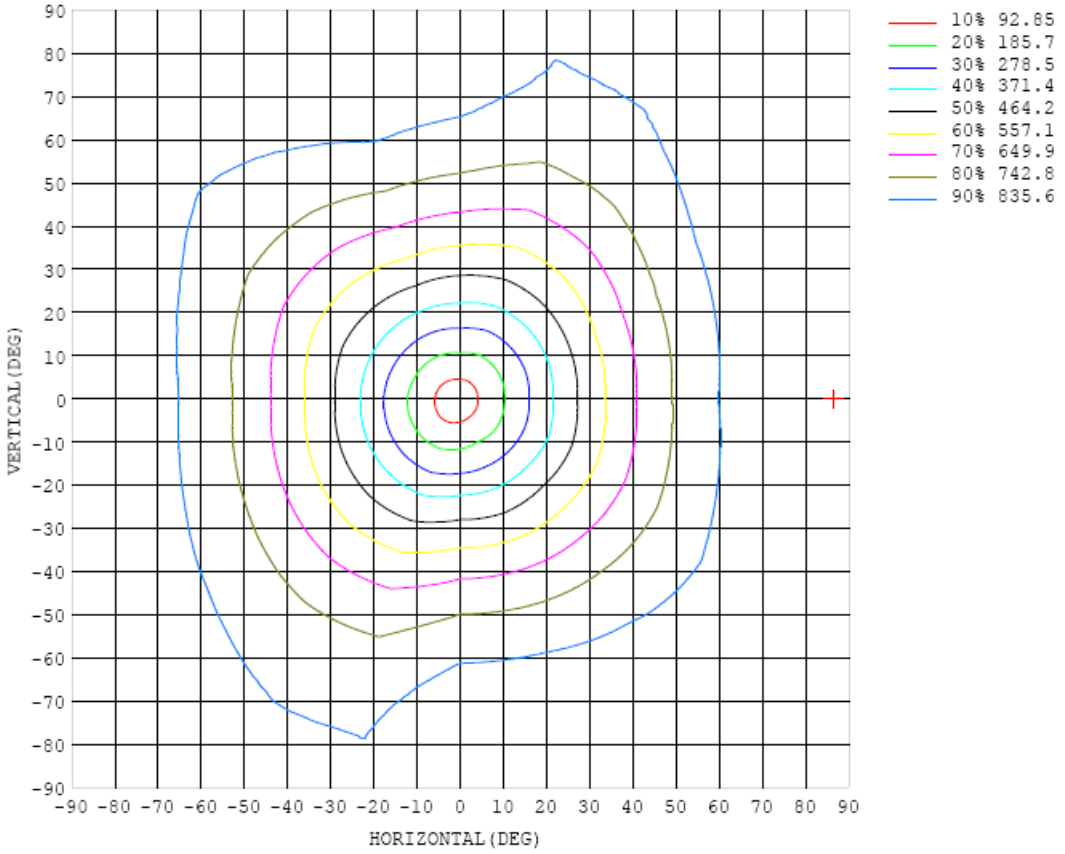


Chart 14 Isocandela Plot

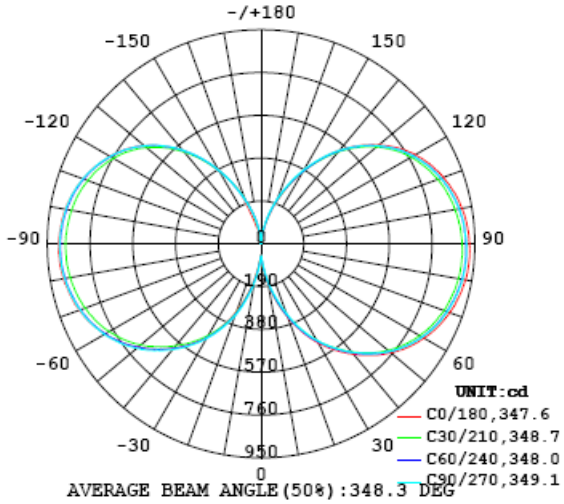


Chart 15: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5			
0	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1			
5	105	102	99.7	95.2	87.5	79.9	77.1	78.3	81.2	85.8	90.4	95.9	100	99.1	102	103			
10	181	178	173	173	160	150	148	149	148	159	165	169	176	170	174	178			
15	263	256	254	249	240	225	223	227	233	239	245	250	257	247	253	255			
20	346	338	339	336	328	307	310	313	318	326	332	336	339	327	333	338			
25	430	417	423	415	417	389	392	393	402	402	410	417	413	404	410	421			
30	508	495	499	492	494	461	459	466	477	469	481	495	485	473	481	498			
35	576	562	567	562	565	525	521	532	544	532	547	562	551	533	543	567			
40	639	626	631	629	629	584	581	593	607	591	606	627	613	589	600	630			
45	700	684	691	691	690	638	637	650	663	647	662	686	671	641	654	688			
50	752	736	745	743	744	685	687	704	716	698	715	739	720	688	704	742			
55	798	779	789	792	789	726	731	751	762	743	761	786	767	729	745	784			
60	837	814	826	830	827	761	766	788	802	780	800	826	804	763	777	822			
65	868	843	857	861	858	790	795	821	834	809	831	857	834	790	805	853			
70	892	865	878	886	880	810	818	846	859	833	853	880	856	811	825	875			
75	910	880	894	901	897	825	834	865	878	850	872	897	875	826	840	894			
80	923	890	907	914	909	837	845	878	892	861	884	909	888	836	851	904			
85	927	894	911	920	914	842	851	885	900	868	891	917	893	843	855	910			
90	927	893	910	918	912	841	851	886	899	869	892	917	897	841	853	909			
95	919	887	905	915	906	836	848	882	894	865	886	911	890	837	847	901			
100	906	876	894	902	893	826	838	873	882	855	878	901	883	826	837	890			
105	889	858	875	887	876	810	823	854	866	842	863	884	866	812	820	871			
110	863	836	852	863	851	789	802	832	841	819	840	863	843	790	798	848			
115	829	806	820	831	819	763	775	803	812	794	810	830	813	761	769	816			
120	791	769	780	793	780	727	741	767	777	758	774	792	775	726	734	778			
125	742	724	734	744	733	685	700	723	732	717	730	745	731	684	691	730			
130	683	669	676	688	677	636	650	668	678	664	676	689	677	631	638	672			
135	616	605	612	620	614	576	589	605	612	602	613	623	616	570	577	606			
140	542	532	538	547	543	509	521	533	541	532	541	551	543	503	506	532			
145	457	452	456	464	463	433	445	452	460	454	462	473	465	425	427	448			
150	368	369	371	379	380	354	365	370	378	373	376	385	380	342	341	360			
155	281	285	288	294	297	278	288	285	295	292	288	297	291	260	260	275			
160	199	205	209	213	215	206	196	197	180	211	208	210	203	186	186	195			
165	127	131	134	140	142	138	90.7	141	76.3	142	139	140	134	122	122	127			
170	64.6	66.1	62.2	66.3	74.5	67.4	57.5	70.1	46.8	69.1	75.5	76.9	74.0	68.0	66.4	66.4			
175	18.1	18.7	15.5	17.6	21.0	22.0	19.0	17.1	15.5	21.4	22.5	23.2	22.5	20.3	18.4	19.8			
180	0.70	0.69	0.52	0.52	0.45	0.47	0.58	0.60	0.69	0.69	0.65	0.60	0.62	0.60	0.66	0.68			

Table 15: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Feb. 18, 2024	-
Digital Power Meter	PF2010A	HZTE028-01	Aug. 01, 2023	Jul. 31, 2024
AC Power Supply	DPS1060	HZTE001-06	Aug. 01, 2023	Jul. 31, 2024
DC Power Supply	WY12010	HZTE004-03	Aug. 01, 2023	Jul. 31, 2024
Temperature recorder	JM624U	HZTE018-08	Aug. 04, 2023	Aug. 03, 2024
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 04, 2023	Aug. 03, 2024
Standard source	D908	HZTE012-01	Aug. 14, 2018	-
Integrate Sphere system	3M	HZTE015-04	Feb. 18, 2024	-
Digital Power Meter	WT210	HZTE008-01	Aug. 01, 2023	Jul. 31, 2024
AC Power Supply	PCR 500L	HZTE001-07	Aug. 01, 2023	Jul.31, 2024
DC Power Supply	IT6154	HZTE004-04	Aug. 01, 2023	Jul. 31, 2024
Standard source	SCL-1400	HZTE012-06	Nov. 04, 2021	-
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 04, 2023	Aug. 03, 2024
Temperature Meter	TES1310	HZTE017-01	Aug. 04, 2023	Aug. 03, 2024

Table 13: 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 lamps) 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 expended 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 lamps) 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 expended 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 ***