



IES LM-79-19

MEASUREMENT AND TEST REPORT

For

RAB LIGHTING INC

170 Ludlow Ave PO BOX 970 Northvale, NJ 07647-2305 USA

#r Test Model: H10045(HID-90-EX39-850-BYP-PT-ECO)

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution
Reviewed By:	Hexy He <i>Hexy He</i>
Report Number:	R2DG201104052-10-1
Test Date:	2020-11-19 to 2020-11-20
Report Date:	2020-12-02
Approved by:	Blake Zhang / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588
Accreditation:	The IAS Accreditation Number TL-460.

1. Product Description

General Information:

One test sample was in good condition and received on 2020-11-04, and used for testing.

#Model Tested: H10045(HID-90-EX39-850-BYP-PT-ECO)

#Manufacturer: RAB LIGHTING INC

#Product Designation: Screw-base Replacements for HID Lamps in Outdoor Pole/Arm-mounted Decorative Luminaires

Burning Time Before Test: 0hour(For New Products)

#Rated Values:

Rated Voltage/Frequency: 120-277V 50/60Hz

Rated Power: 90W

Nominal CCT: 5000K

Nominal Lumen Output: 13500lm

#Family Declaration

RAB LIGHTING INC declares that there are some differences between multiple models and tested model. Details as below:

Tested Model	Multiple Models	Variations	Details
H10045(HID-90-EX39-850-BYP-PT-ECO)	HID-90-EX39-850-BYP-PT-ECO	Model number	The product is the same, except for the model number.

2. Standards Used

- ANSI/IES LM-79-19: Approved method :Optical and Electrical Measurements of Solid-State Lighting Products
- ANSI C82.77-10-2014: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-18: IES Method for Evaluating Light Source Color Rendition (This method is not in IAS accreditation scope)

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
1.5m temperature integrating sphere	SENSING	SPR-600	S09008	2020-10-21	2021-10-20
High-precision rapid spectral analysis system	EVERFINE	HAAS-2000	M112048CA1361125	2020-10-21	2021-10-20
Digital power meter	YOKOGAWA	WT310	13398	2020-07-01	2021-06-30
Programmable Precision DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	2020-04-10	2021-04-09
thermometer	SENSING	NA	NA	2020-03-13	2021-03-12
Standard Light Source	EVERFINE	D204	N/A	2020-07-19	2021-07-18
Precision frequency power supply	ALL Power	APW-105N	970613	2020-03-10	2021-03-09

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	2020-03-13	2021-03-12
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	2020-03-13	2021-03-12
Digital power meter	YOKOGAWA	WT-210	91j926132	2020-03-13	2021-03-12
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	2020-03-13	2021-03-12
Wireless Remote Sensor	N/A	433MHz	N/A	2020-03-13	2021-03-12
Standard Light Source	EVERFINE	D908	1012003	2020-10-20	2021-10-19

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with ANSI/IES LM-79-19. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at $25^{\circ}\text{C}\pm 1.2^{\circ}\text{C}$ during measurement. And relative humidity is maintained between 10% and 65%. The air flow around the SSL product is less than 0.2m/s.

Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum light source before measurement.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is $U=2.1\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=22\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.1(K=2)$, at the 95% confidence level.

The uncertainty of power meter AC current $U=0.39\%$ of rdg, AC Voltage $U=0.25\%$ of rdg, Power $U=0.42\%$ ($K=2$), at the 95% confidence level.

Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report. For luminous intensity distribution, The vertical angle (γ) test intervals were set no more than 2.5 degree, The horizontal angle (C plane) test intervals were set no more than 22.5 degree. For color spatial uniformity, The vertical angle (γ) test intervals were set no more than 90 degree, The horizontal angle (C plane) test intervals were set no more than 10 degree

The uncertainty of the luminous intensity is $U=2.00\%$ ($K=2$), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_f , R_g was calculated according to IES TM-30-18 by using calculation tools. The calculation was based on the measured SPD from 380nm to 780nm with 1nm intervals. All the colors in this report is for reference only.

5. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Base up**

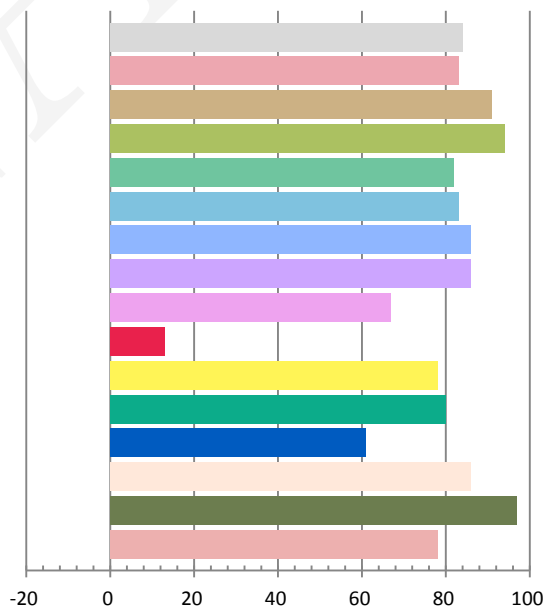
Photometric and Electrical Measurement Result

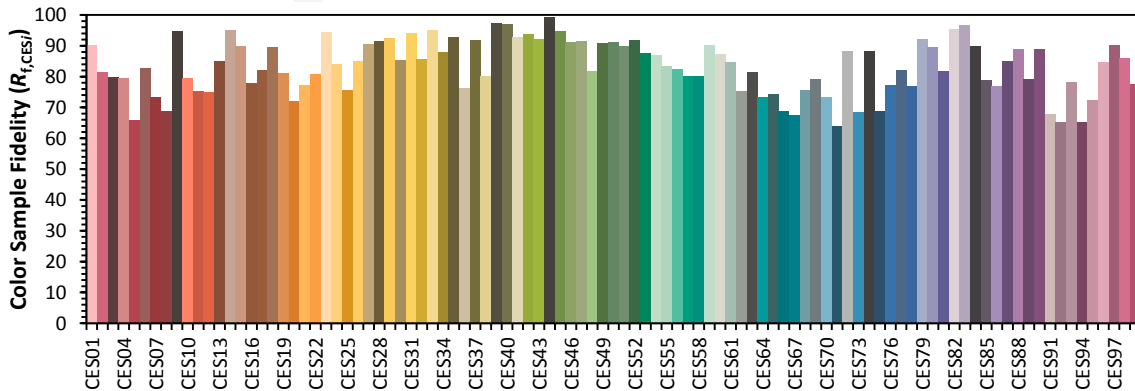
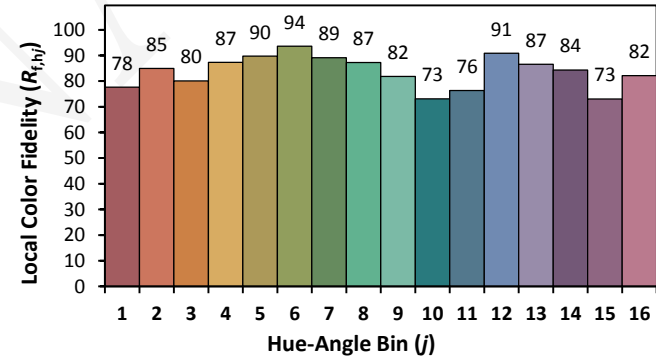
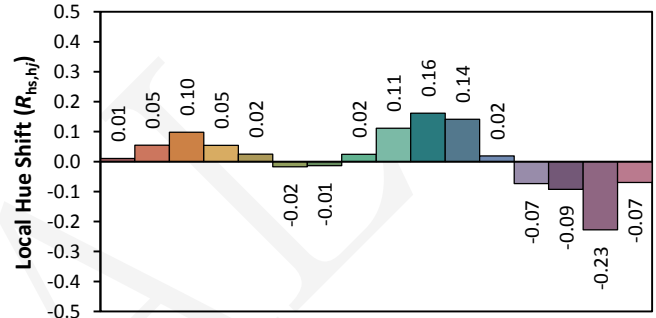
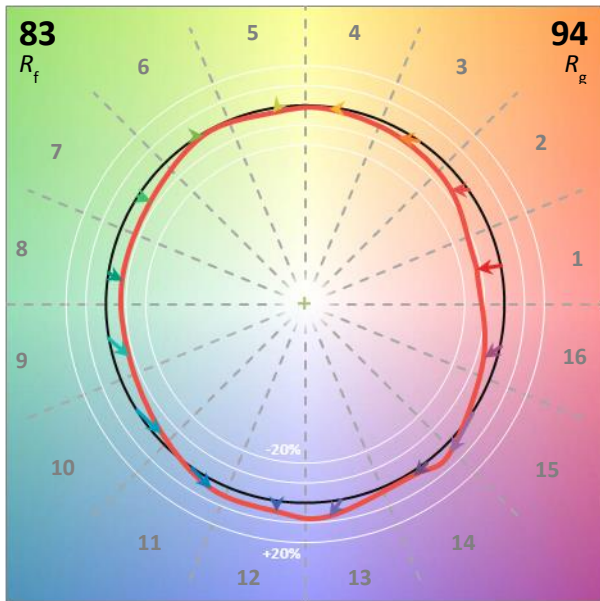
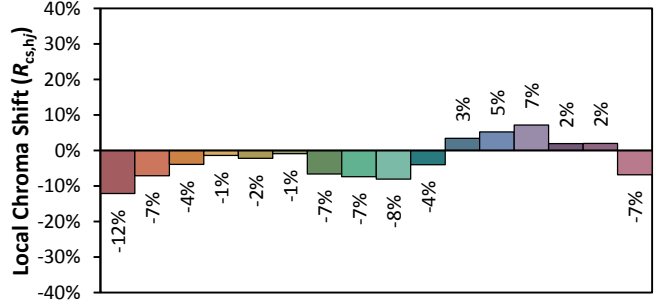
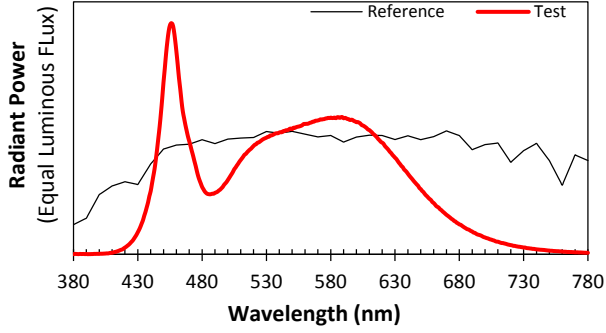
Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.7789	92.22	0.9865	9690.6	105.08

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
30.394	5016	0.00130	0.3449	0.3540	0.2103	0.4858

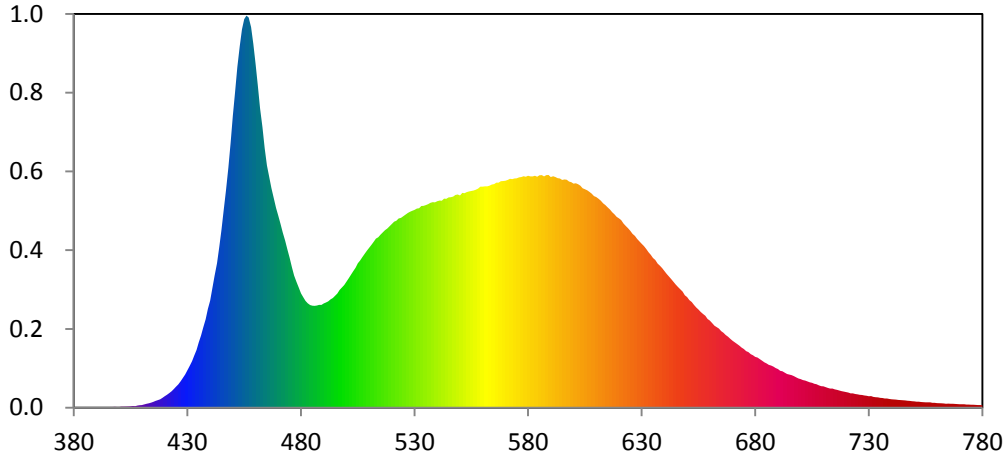
Color Rendering Index

Ra			
84.1			
R1	R2	R3	R4
83	91	94	82
R5	R6	R7	R8
83	86	86	67
R9	R10	R11	R12
13	78	80	61
R13	R14	R15	
86	97	78	





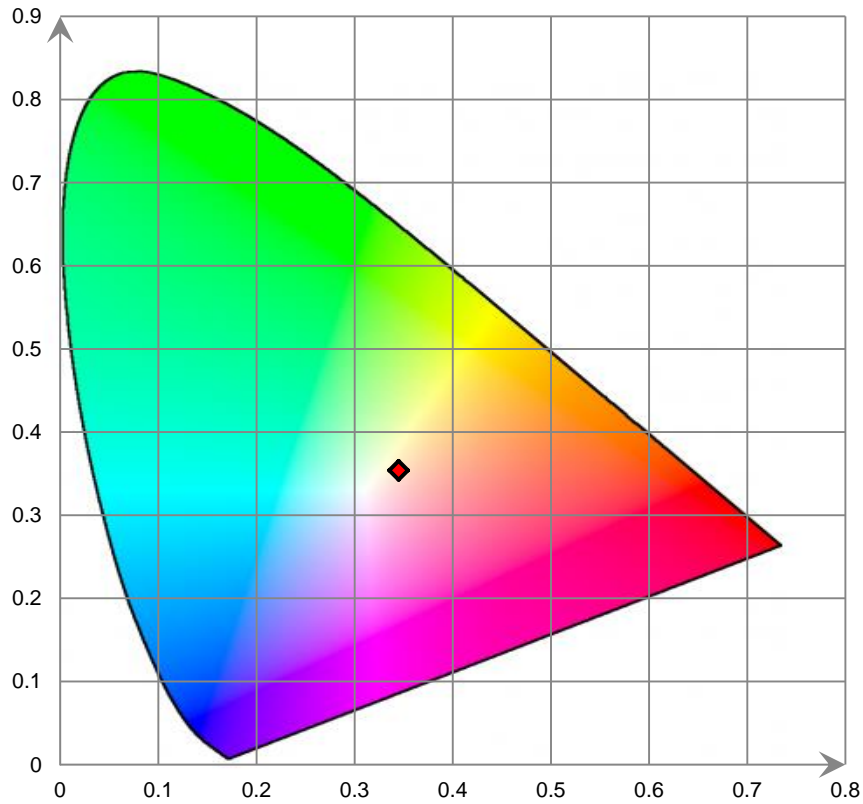
Relative Spectral Power Distribution



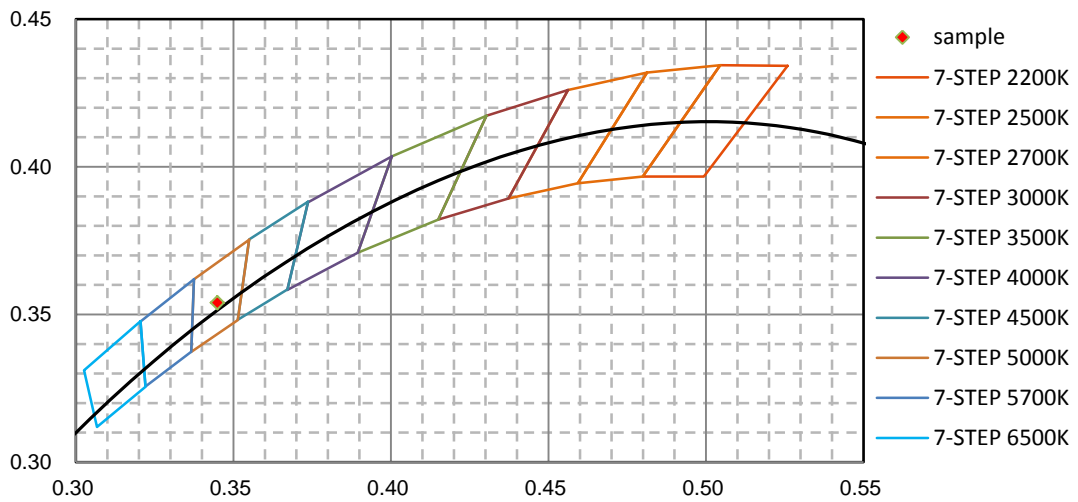
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.970E-01	421	8.563E+00	462	1.984E+02	503	9.036E+01	544	1.385E+02
381	4.935E-01	422	9.766E+00	463	1.860E+02	504	9.278E+01	545	1.394E+02
382	4.443E-01	423	1.087E+01	464	1.719E+02	505	9.565E+01	546	1.395E+02
383	3.193E-01	424	1.235E+01	465	1.606E+02	506	9.748E+01	547	1.399E+02
384	2.519E-01	425	1.397E+01	466	1.530E+02	507	9.976E+01	548	1.410E+02
385	4.699E-01	426	1.543E+01	467	1.455E+02	508	1.018E+02	549	1.413E+02
386	3.634E-01	427	1.754E+01	468	1.388E+02	509	1.041E+02	550	1.407E+02
387	3.789E-01	428	1.974E+01	469	1.324E+02	510	1.060E+02	551	1.423E+02
388	4.188E-01	429	2.208E+01	470	1.272E+02	511	1.079E+02	552	1.421E+02
389	2.683E-01	430	2.484E+01	471	1.218E+02	512	1.099E+02	553	1.428E+02
390	3.795E-01	431	2.762E+01	472	1.161E+02	513	1.120E+02	554	1.433E+02
391	1.815E-01	432	3.083E+01	473	1.107E+02	514	1.129E+02	555	1.436E+02
392	2.708E-01	433	3.463E+01	474	1.048E+02	515	1.147E+02	556	1.440E+02
393	2.547E-01	434	3.828E+01	475	9.936E+01	516	1.162E+02	557	1.445E+02
394	3.359E-01	435	4.334E+01	476	9.317E+01	517	1.176E+02	558	1.453E+02
395	3.263E-01	436	4.778E+01	477	8.759E+01	518	1.187E+02	559	1.465E+02
396	5.068E-01	437	5.321E+01	478	8.328E+01	519	1.203E+02	560	1.465E+02
397	4.817E-01	438	5.857E+01	479	7.956E+01	520	1.218E+02	561	1.467E+02
398	5.743E-01	439	6.546E+01	480	7.579E+01	521	1.232E+02	562	1.467E+02
399	5.382E-01	440	7.087E+01	481	7.324E+01	522	1.238E+02	563	1.472E+02
400	5.393E-01	441	7.919E+01	482	7.079E+01	523	1.254E+02	564	1.479E+02
401	6.928E-01	442	8.750E+01	483	6.917E+01	524	1.258E+02	565	1.482E+02
402	6.712E-01	443	9.572E+01	484	6.806E+01	525	1.268E+02	566	1.491E+02
403	7.611E-01	444	1.064E+02	485	6.767E+01	526	1.279E+02	567	1.491E+02
404	8.301E-01	445	1.180E+02	486	6.747E+01	527	1.290E+02	568	1.501E+02
405	9.401E-01	446	1.311E+02	487	6.769E+01	528	1.298E+02	569	1.502E+02
406	1.092E+00	447	1.440E+02	488	6.816E+01	529	1.305E+02	570	1.505E+02
407	1.050E+00	448	1.591E+02	489	6.811E+01	530	1.311E+02	571	1.509E+02
408	1.450E+00	449	1.755E+02	490	6.907E+01	531	1.320E+02	572	1.517E+02
409	1.663E+00	450	1.936E+02	491	6.969E+01	532	1.322E+02	573	1.515E+02
410	1.770E+00	451	2.092E+02	492	7.042E+01	533	1.336E+02	574	1.519E+02
411	2.169E+00	452	2.257E+02	493	7.172E+01	534	1.337E+02	575	1.520E+02
412	2.603E+00	453	2.394E+02	494	7.272E+01	535	1.343E+02	576	1.527E+02
413	2.900E+00	454	2.506E+02	495	7.423E+01	536	1.350E+02	577	1.528E+02
414	3.391E+00	455	2.575E+02	496	7.570E+01	537	1.358E+02	578	1.534E+02
415	3.895E+00	456	2.598E+02	497	7.797E+01	538	1.361E+02	579	1.531E+02
416	4.543E+00	457	2.585E+02	498	7.962E+01	539	1.361E+02	580	1.537E+02
417	5.094E+00	458	2.521E+02	499	8.130E+01	540	1.369E+02	581	1.532E+02
418	5.571E+00	459	2.410E+02	500	8.353E+01	541	1.373E+02	582	1.533E+02
419	6.614E+00	460	2.279E+02	501	8.573E+01	542	1.372E+02	583	1.537E+02
420	7.625E+00	461	2.136E+02	502	8.808E+01	543	1.385E+02	584	1.530E+02

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.540E+02	626	1.152E+02	667	4.821E+01	708	1.477E+01	749	4.303E+00
586	1.541E+02	627	1.138E+02	668	4.701E+01	709	1.431E+01	750	4.222E+00
587	1.533E+02	628	1.118E+02	669	4.572E+01	710	1.422E+01	751	4.002E+00
588	1.541E+02	629	1.103E+02	670	4.442E+01	711	1.366E+01	752	4.032E+00
589	1.543E+02	630	1.086E+02	671	4.337E+01	712	1.312E+01	753	3.788E+00
590	1.529E+02	631	1.072E+02	672	4.224E+01	713	1.272E+01	754	3.727E+00
591	1.534E+02	632	1.051E+02	673	4.109E+01	714	1.266E+01	755	3.639E+00
592	1.529E+02	633	1.030E+02	674	3.981E+01	715	1.220E+01	756	3.536E+00
593	1.521E+02	634	1.013E+02	675	3.892E+01	716	1.191E+01	757	3.544E+00
594	1.519E+02	635	9.924E+01	676	3.751E+01	717	1.141E+01	758	3.311E+00
595	1.509E+02	636	9.798E+01	677	3.690E+01	718	1.098E+01	759	3.319E+00
596	1.513E+02	637	9.552E+01	678	3.547E+01	719	1.068E+01	760	3.053E+00
597	1.510E+02	638	9.415E+01	679	3.478E+01	720	1.036E+01	761	3.013E+00
598	1.499E+02	639	9.257E+01	680	3.365E+01	721	1.011E+01	762	2.947E+00
599	1.494E+02	640	9.056E+01	681	3.324E+01	722	9.563E+00	763	2.881E+00
600	1.485E+02	641	8.866E+01	682	3.219E+01	723	9.528E+00	764	2.646E+00
601	1.487E+02	642	8.687E+01	683	3.114E+01	724	9.137E+00	765	2.719E+00
602	1.480E+02	643	8.524E+01	684	3.015E+01	725	8.880E+00	766	2.592E+00
603	1.471E+02	644	8.340E+01	685	2.930E+01	726	8.587E+00	767	2.595E+00
604	1.454E+02	645	8.163E+01	686	2.836E+01	727	8.469E+00	768	2.469E+00
605	1.448E+02	646	8.006E+01	687	2.797E+01	728	8.170E+00	769	2.420E+00
606	1.440E+02	647	7.840E+01	688	2.722E+01	729	7.970E+00	770	2.259E+00
607	1.430E+02	648	7.691E+01	689	2.622E+01	730	7.627E+00	771	2.274E+00
608	1.418E+02	649	7.448E+01	690	2.566E+01	731	7.687E+00	772	2.282E+00
609	1.403E+02	650	7.332E+01	691	2.448E+01	732	7.174E+00	773	2.112E+00
610	1.397E+02	651	7.136E+01	692	2.415E+01	733	6.937E+00	774	2.138E+00
611	1.384E+02	652	7.009E+01	693	2.319E+01	734	6.839E+00	775	2.039E+00
612	1.371E+02	653	6.812E+01	694	2.238E+01	735	6.585E+00	776	1.952E+00
613	1.354E+02	654	6.642E+01	695	2.198E+01	736	6.462E+00	777	1.850E+00
614	1.343E+02	655	6.510E+01	696	2.154E+01	737	6.136E+00	778	1.802E+00
615	1.329E+02	656	6.346E+01	697	2.098E+01	738	6.142E+00	779	1.790E+00
616	1.314E+02	657	6.211E+01	698	2.014E+01	739	5.846E+00	780	1.734E+00
617	1.295E+02	658	6.094E+01	699	1.940E+01	740	5.634E+00		
618	1.281E+02	659	5.884E+01	700	1.896E+01	741	5.461E+00		
619	1.264E+02	660	5.777E+01	701	1.833E+01	742	5.347E+00		
620	1.255E+02	661	5.620E+01	702	1.801E+01	743	5.159E+00		
621	1.244E+02	662	5.437E+01	703	1.740E+01	744	5.110E+00		
622	1.220E+02	663	5.338E+01	704	1.681E+01	745	4.970E+00		
623	1.204E+02	664	5.248E+01	705	1.649E+01	746	4.886E+00		
624	1.189E+02	665	5.072E+01	706	1.588E+01	747	4.682E+00		
625	1.172E+02	666	4.968E+01	707	1.554E+01	748	4.498E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.0 hour**

Test orientation: **Base up**

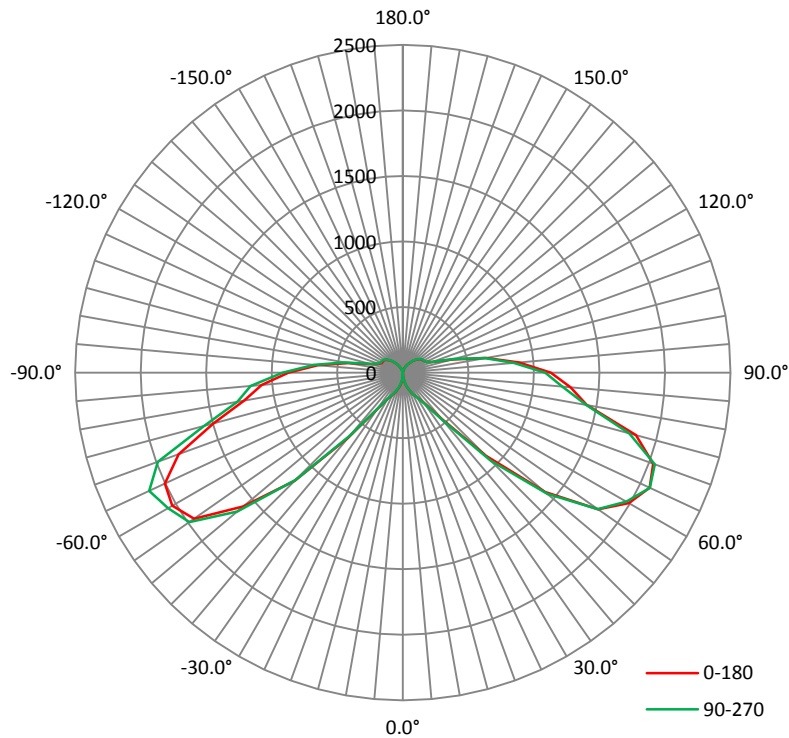
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60	0.7831	92.20	0.9809

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
9693.09	105.13	2194	21.86	21.86

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	360.0	360.0	360.0	360.0	360.0
Field Angle (10% I _{max}):	360.0	360.0	360.0	360.0	360.0

Luminous Intensity (cd) Distribution Data

C Y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0°	1	1	1	1	1	1	1	1
1°	24	29	26	22	11	10	7	10
2°	32	37	34	30	21	17	13	7
3°	41	44	42	38	32	24	20	14
4°	49	51	50	46	40	33	28	20
5°	57	58	57	53	48	42	35	27
6°	65	65	64	60	55	50	42	34
7°	73	72	73	68	62	57	50	41
8°	79	80	82	77	69	66	58	52
9°	86	88	89	85	75	74	66	63
10°	92	96	95	91	82	81	74	71
11°	97	102	100	97	88	88	81	79
12°	103	107	105	102	95	95	89	86
13°	108	113	110	107	101	100	96	92
14°	114	118	116	112	108	106	102	99
15°	120	124	121	118	114	112	108	105
16°	126	130	127	124	120	117	114	111
17°	132	136	134	130	126	123	120	117
18°	139	143	141	136	132	130	127	124
19°	146	151	148	143	139	136	133	131
20°	153	158	156	151	147	144	140	138
21°	160	165	163	159	155	152	149	146
22°	167	172	170	166	163	160	157	154
23°	174	179	177	174	170	167	165	163
24°	181	186	185	182	178	174	171	170
25°	188	193	191	188	185	182	179	178
26°	194	200	199	195	192	188	186	185
27°	202	207	206	202	199	195	193	192
28°	209	216	214	211	207	202	200	199
29°	219	226	224	220	215	210	207	206
30°	230	238	235	232	225	218	214	213
31°	245	254	251	247	238	229	223	221
32°	263	273	272	266	255	243	235	230
33°	285	298	297	290	277	262	250	242
34°	313	327	327	321	304	285	270	259
35°	344	363	364	357	336	313	294	280
36°	381	405	409	399	376	347	323	306
37°	431	459	466	452	424	386	356	336
38°	495	528	531	516	481	434	396	369
39°	572	603	611	589	549	495	447	412
40°	650	694	694	676	626	564	510	467
41°	746	784	797	763	711	648	589	538
42°	849	895	902	870	810	736	672	619
43°	958	1008	1025	985	917	838	768	717
44°	1062	1118	1144	1109	1030	948	874	809
45°	1166	1226	1249	1225	1158	1078	994	921
46°	1266	1321	1343	1323	1280	1194	1119	1039
47°	1366	1416	1437	1420	1378	1298	1242	1151
48°	1441	1511	1531	1518	1475	1400	1333	1259
49°	1511	1593	1607	1606	1565	1502	1422	1354

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
50°	1589	1675	1688	1694	1649	1594	1512	1448
51°	1681	1740	1763	1763	1733	1680	1603	1543
52°	1753	1809	1832	1824	1793	1754	1688	1618
53°	1848	1860	1899	1893	1852	1824	1758	1695
54°	1913	1925	1969	1946	1913	1871	1810	1771
55°	1943	1966	2005	2015	1988	1928	1854	1856
56°	1969	2000	2040	2056	2041	1994	1922	1912
57°	2005	2048	2058	2091	2053	2045	1982	1982
58°	2006	2072	2085	2118	2055	2069	2014	2002
59°	2032	2104	2097	2134	2063	2110	2050	2014
60°	2031	2129	2120	2175	2068	2125	2081	2055
61°	2035	2153	2127	2180	2103	2125	2095	2080
62°	2024	2142	2115	2165	2121	2119	2103	2076
63°	2032	2132	2122	2154	2126	2118	2134	2090
64°	2001	2094	2103	2149	2138	2102	2131	2081
65°	2002	2071	2095	2136	2134	2084	2125	2068
66°	1970	2032	2051	2094	2126	2074	2122	2050
67°	1948	2014	2034	2062	2102	2046	2114	2055
68°	1908	1969	2007	2028	2078	2028	2088	2044
69°	1870	1912	1970	1968	2040	2014	2067	2022
70°	1821	1879	1893	1913	1988	1972	2026	2000
71°	1766	1790	1835	1859	1901	1938	1986	1965
72°	1692	1734	1755	1773	1845	1876	1917	1919
73°	1627	1627	1668	1704	1738	1816	1882	1869
74°	1535	1584	1591	1618	1666	1739	1794	1822
75°	1494	1502	1517	1575	1570	1663	1724	1749
76°	1433	1454	1462	1487	1509	1616	1637	1690
77°	1372	1395	1408	1454	1460	1543	1573	1606
78°	1311	1350	1360	1387	1385	1496	1497	1564
79°	1258	1300	1333	1351	1356	1421	1434	1506
80°	1228	1278	1283	1298	1281	1386	1372	1459
81°	1192	1229	1275	1279	1276	1325	1342	1397
82°	1159	1203	1222	1240	1215	1297	1311	1362
83°	1136	1186	1205	1211	1221	1255	1282	1303
84°	1114	1143	1177	1184	1150	1233	1252	1278
85°	1081	1115	1126	1146	1165	1189	1237	1230
86°	1036	1072	1101	1113	1095	1166	1201	1213
87°	1015	1032	1026	1051	1081	1126	1178	1172
88°	967	989	1008	1013	1004	1079	1134	1155
89°	933	939	935	955	981	1034	1102	1107
90°	872	887	892	907	916	987	1032	1072
91°	829	837	835	846	865	929	1004	1011
92°	783	786	787	791	818	880	933	976
93°	740	739	733	741	767	816	892	916
94°	688	689	694	698	725	773	828	872
95°	650	645	646	652	678	721	784	825
96°	604	601	598	606	635	681	730	775
97°	564	557	551	561	591	634	686	731
98°	518	503	507	517	548	587	639	693
99°	474	455	446	462	498	539	592	646

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
100°	421	400	397	416	449	488	546	598
101°	380	354	349	364	400	435	485	551
102°	333	313	309	324	352	389	441	493
103°	300	284	279	291	312	342	383	445
104°	273	260	258	267	280	303	339	390
105°	249	244	243	249	258	274	298	343
106°	234	231	230	235	242	253	267	305
107°	221	221	218	224	229	238	247	272
108°	211	211	209	214	219	226	232	249
109°	203	204	201	206	209	216	222	234
110°	195	197	195	198	202	209	213	223
111°	188	192	191	192	195	203	206	214
112°	183	188	187	188	190	198	200	207
113°	179	185	185	185	187	193	195	201
114°	177	184	183	183	185	190	190	196
115°	176	184	183	183	184	187	187	191
116°	175	184	183	183	184	186	185	188
117°	176	183	183	184	185	185	185	186
118°	176	183	182	184	185	185	185	185
119°	176	183	182	184	184	185	185	185
120°	175	183	181	184	183	184	185	184
121°	175	183	180	184	181	183	184	183
122°	174	182	179	182	180	181	182	181
123°	173	180	178	180	178	179	179	179
124°	172	178	176	177	176	176	176	176
125°	169	174	173	174	173	173	174	174
126°	165	169	169	170	169	169	172	171
127°	162	165	166	167	165	166	168	167
128°	158	161	162	164	162	162	164	164
129°	154	157	159	161	159	158	159	160
130°	150	153	156	157	155	153	154	156
131°	146	150	153	154	152	150	149	151
132°	142	147	149	150	148	147	144	146
133°	139	143	144	146	144	144	140	142
134°	135	138	138	140	139	139	136	138
135°	130	133	133	135	134	134	132	135
136°	125	127	127	128	128	129	128	131
137°	121	122	121	123	123	124	124	126
138°	115	116	115	117	117	118	119	121
139°	108	110	109	111	111	113	114	116
140°	103	104	103	105	106	107	109	111
141°	97	98	98	100	100	101	104	106
142°	91	94	94	95	95	96	98	101
143°	87	90	90	91	91	91	93	96
144°	84	87	86	87	87	87	88	90
145°	81	83	82	82	83	83	84	86
146°	78	78	77	78	79	80	81	82
147°	73	73	72	73	75	77	78	79
148°	68	69	67	68	71	73	75	76
149°	64	63	62	64	67	69	71	73

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
150°	59	58	58	59	62	65	67	70
151°	55	54	54	55	57	61	63	66
152°	51	50	50	51	53	57	59	62
153°	47	46	46	47	50	52	55	58
154°	43	42	42	43	46	49	52	54
155°	40	38	38	39	41	45	48	51
156°	36	34	34	35	37	41	44	47
157°	32	30	30	31	33	37	40	44
158°	28	26	26	27	29	33	37	40
159°	25	22	22	23	25	28	33	36
160°	21	19	18	20	21	24	29	32
161°	18	16	15	16	18	21	25	28
162°	15	13	12	13	14	17	21	24
163°	12	10	10	10	12	14	17	21
164°	10	8	7	8	9	11	14	17
165°	7	6	5	6	7	9	12	14
166°	5	4	3	4	5	7	9	11
167°	4	2	2	2	3	5	7	9
168°	2	1	1	2	2	3	5	7
169°	1	1	1	1	2	2	3	5
170°	1	1	1	1	1	2	2	4
171°	1	1	1	1	1	1	2	2
172°	1	1	1	1	1	1	1	2
173°	1	1	1	1	1	1	1	1
174°	1	1	1	1	1	1	1	1
175°	1	1	1	1	1	1	1	1
176°	1	1	1	1	1	1	1	1
177°	1	1	1	1	1	1	1	1
178°	1	1	1	1	1	1	1	1
179°	1	1	1	1	1	1	1	1
180°	1	1	1	1	1	1	1	1

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0°	1	1	1	1	1	1	1	1
1°	3	3	5	3	1	7	13	20
2°	7	1	7	5	7	13	21	29
3°	13	7	9	8	12	20	29	37
4°	19	13	11	15	20	28	37	45
5°	26	20	19	23	28	37	45	53
6°	33	27	28	31	36	44	53	59
7°	41	35	36	40	44	53	61	66
8°	52	45	45	49	52	62	69	73
9°	62	56	54	58	60	71	77	79
10°	71	66	63	67	68	78	84	85
11°	79	76	72	75	77	85	90	92
12°	86	84	81	83	84	91	96	99
13°	92	91	89	90	91	98	101	104
14°	99	99	97	97	98	103	107	110
15°	105	105	104	104	104	109	113	116
16°	112	113	111	111	111	115	119	123
17°	118	119	118	117	117	121	125	128
18°	125	126	125	124	124	128	131	135
19°	132	133	132	131	131	135	138	142
20°	139	141	140	138	139	142	145	150
21°	148	149	147	146	146	150	152	157
22°	157	157	155	154	155	157	160	164
23°	165	165	164	163	163	166	168	171
24°	173	174	172	171	171	173	175	178
25°	180	182	181	180	179	181	183	186
26°	188	190	189	188	187	189	191	193
27°	196	197	197	196	196	197	198	200
28°	202	205	205	204	203	204	206	207
29°	209	212	212	212	211	212	214	217
30°	215	220	220	219	219	221	223	227
31°	223	228	229	228	228	231	235	241
32°	232	236	238	238	238	243	249	257
33°	244	248	248	250	252	260	268	278
34°	261	263	263	266	271	281	289	303
35°	280	282	283	286	293	305	314	332
36°	304	305	306	311	320	334	344	366
37°	334	332	333	338	346	362	379	408
38°	367	363	364	368	380	402	428	466
39°	406	399	397	402	419	448	482	539
40°	457	445	442	452	477	530	559	612
41°	522	505	500	534	563	612	636	685
42°	597	586	580	615	648	694	739	788
43°	689	668	660	698	735	784	830	888
44°	782	771	764	803	847	899	940	989
45°	897	884	877	917	953	997	1038	1095
46°	1009	998	992	1027	1062	1098	1133	1191
47°	1122	1113	1107	1133	1173	1193	1224	1273
48°	1237	1215	1211	1239	1269	1287	1300	1358
49°	1327	1324	1303	1349	1364	1376	1385	1434

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
50°	1417	1425	1390	1422	1438	1452	1460	1513
51°	1507	1508	1485	1510	1528	1532	1535	1590
52°	1600	1596	1572	1583	1601	1603	1610	1644
53°	1694	1682	1655	1645	1680	1671	1694	1706
54°	1760	1756	1720	1706	1751	1721	1772	1759
55°	1819	1841	1781	1766	1815	1802	1823	1822
56°	1853	1921	1848	1819	1856	1853	1851	1872
57°	1915	1963	1909	1898	1888	1898	1881	1909
58°	1980	2006	1955	1967	1924	1927	1903	1931
59°	1999	2052	1999	2031	1939	1963	1939	1969
60°	1992	2072	2023	2064	1969	1983	1962	1997
61°	2019	2108	2075	2084	1999	2008	1996	2017
62°	2044	2113	2104	2106	2031	2025	2010	2029
63°	2060	2137	2154	2126	2057	2048	2017	2026
64°	2075	2119	2176	2129	2082	2025	2006	2010
65°	2078	2114	2178	2144	2080	2055	2012	2000
66°	2098	2099	2186	2137	2100	2045	1982	1972
67°	2087	2086	2194	2122	2098	2010	1995	1976
68°	2091	2047	2174	2098	2091	2002	1947	1933
69°	2069	2037	2191	2090	2068	1964	1936	1923
70°	2032	2017	2146	2059	2045	1939	1875	1866
71°	2012	1996	2134	2043	2013	1882	1853	1840
72°	1970	1971	2083	1995	1972	1867	1798	1758
73°	1944	1941	2039	1970	1930	1815	1756	1709
74°	1872	1907	1999	1907	1855	1767	1659	1592
75°	1841	1860	1933	1868	1787	1689	1590	1534
76°	1732	1815	1873	1788	1696	1611	1495	1450
77°	1675	1739	1785	1728	1629	1535	1463	1401
78°	1567	1678	1719	1645	1537	1465	1403	1357
79°	1520	1605	1649	1589	1474	1417	1344	1313
80°	1425	1562	1572	1519	1421	1368	1285	1270
81°	1396	1506	1517	1471	1368	1319	1226	1242
82°	1340	1478	1473	1419	1316	1238	1214	1207
83°	1332	1431	1426	1372	1285	1234	1179	1178
84°	1290	1384	1403	1325	1250	1167	1165	1151
85°	1284	1338	1380	1306	1222	1173	1135	1129
86°	1242	1334	1357	1269	1201	1114	1122	1093
87°	1233	1273	1305	1244	1154	1121	1089	1059
88°	1194	1268	1289	1209	1151	1075	1062	1040
89°	1176	1223	1247	1200	1102	1051	1029	983
90°	1129	1209	1235	1163	1086	1012	992	956
91°	1096	1143	1172	1121	1026	975	947	890
92°	1038	1117	1145	1077	1009	940	896	854
93°	998	1053	1083	1039	948	889	840	802
94°	928	1016	1046	986	907	842	802	759
95°	888	944	971	931	851	802	740	713
96°	835	907	926	881	818	763	697	658
97°	786	844	866	841	764	716	654	618
98°	737	800	807	782	719	677	609	570
99°	692	746	754	736	674	639	567	515

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
100°	642	703	702	690	637	589	522	468
101°	592	655	652	639	582	547	475	423
102°	542	603	603	588	542	495	431	371
103°	487	553	552	538	495	444	386	331
104°	435	500	507	488	448	402	339	297
105°	385	444	451	441	404	357	302	264
106°	341	391	406	391	362	315	269	243
107°	301	342	357	348	317	279	243	227
108°	271	303	314	310	286	252	226	216
109°	249	271	278	278	255	232	214	206
110°	234	250	254	251	236	219	205	199
111°	223	235	237	234	222	209	197	193
112°	215	226	225	223	212	201	192	188
113°	208	218	217	215	204	195	188	183
114°	201	212	210	208	198	189	184	179
115°	194	207	204	202	192	185	180	177
116°	189	201	200	196	188	182	177	175
117°	186	197	196	192	185	179	176	174
118°	184	194	193	188	184	178	176	174
119°	183	194	191	186	183	178	176	174
120°	182	193	191	185	184	178	176	173
121°	182	193	190	185	184	178	175	173
122°	181	192	189	184	185	178	173	172
123°	180	190	187	183	184	178	172	171
124°	178	188	186	180	182	178	171	170
125°	175	184	183	178	179	176	169	168
126°	173	181	180	176	176	173	165	165
127°	170	178	177	174	172	169	162	161
128°	166	174	174	171	168	165	159	157
129°	163	170	171	168	164	160	155	154
130°	160	167	167	164	160	156	152	150
131°	155	163	163	160	155	151	147	145
132°	150	158	159	155	151	147	143	141
133°	145	154	154	151	147	143	140	139
134°	141	149	149	147	143	140	137	136
135°	138	145	145	143	141	137	133	132
136°	134	141	141	141	138	133	129	127
137°	130	138	138	137	134	128	123	122
138°	125	132	133	133	129	124	118	116
139°	121	127	128	128	125	118	112	110
140°	116	122	123	123	119	113	106	104
141°	111	116	117	117	113	107	100	99
142°	105	111	111	111	107	101	95	93
143°	100	105	105	106	101	95	90	88
144°	95	99	100	100	96	90	86	84
145°	89	94	94	94	90	86	82	81
146°	85	88	89	89	86	82	79	78
147°	81	84	85	86	82	80	76	75
148°	79	81	83	83	80	76	73	70
149°	76	79	80	80	76	73	68	65

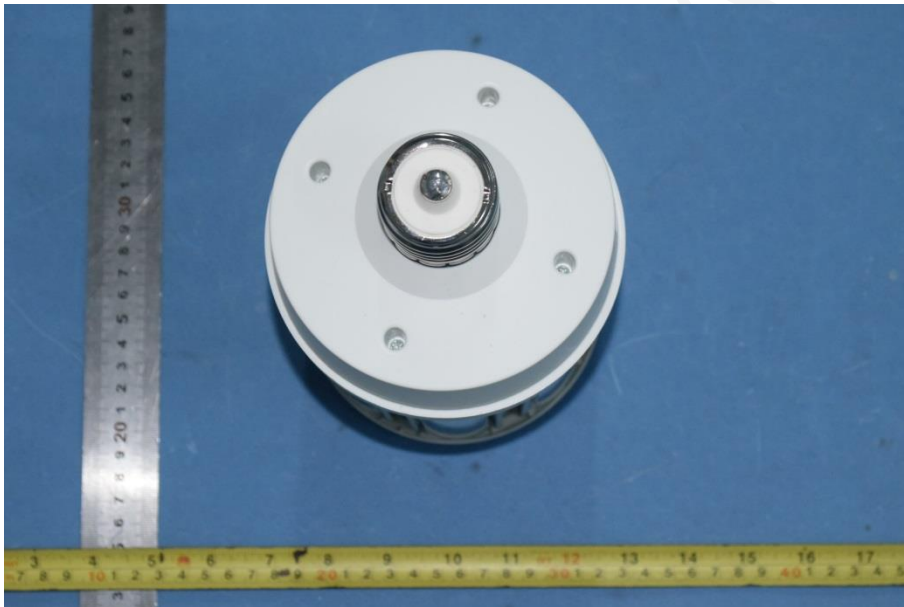
Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
150°	72	76	77	76	73	68	64	61
151°	69	72	73	72	68	63	60	57
152°	65	67	68	67	63	59	56	53
153°	61	63	64	63	59	55	53	50
154°	58	60	60	59	55	52	49	46
155°	54	56	56	54	51	49	46	42
156°	51	53	53	51	48	46	43	39
157°	47	50	50	48	45	43	39	35
158°	44	47	47	45	42	39	35	31
159°	40	44	44	41	39	35	31	27
160°	36	39	39	38	35	31	27	23
161°	32	35	35	34	31	27	23	20
162°	28	31	31	29	26	23	20	17
163°	24	26	26	25	22	19	17	14
164°	20	22	22	21	19	16	14	12
165°	17	19	19	18	16	14	11	9
166°	14	16	16	15	13	11	8	7
167°	11	13	13	12	10	8	6	5
168°	8	10	10	9	8	6	4	3
169°	7	7	8	7	6	5	3	2
170°	5	6	6	5	5	3	2	2
171°	3	4	4	4	3	2	2	1
172°	2	3	3	3	2	2	2	1
173°	2	2	2	2	2	1	1	1
174°	1	2	2	2	1	1	1	1
175°	1	1	1	1	1	1	1	1
176°	1	1	1	1	1	1	1	1
177°	1	1	1	1	1	1	1	1
178°	1	1	1	1	1	1	1	1
179°	1	1	1	1	1	1	1	1
180°	1	1	1	1	1	1	1	1

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	0.6	0.01	0-5	0.6	0.01
5-10	4.4	0.04	0-10	5.0	0.05
10-15	11.5	0.12	0-15	16.5	0.17
15-20	21.2	0.22	0-20	37.6	0.39
20-25	34.6	0.36	0-25	72.3	0.75
25-30	51.4	0.53	0-30	123.6	1.28
30-35	77.1	0.79	0-35	200.8	2.07
35-40	139.5	1.44	0-40	340.3	3.51
40-45	290.9	3.00	0-45	631.2	6.51
45-50	524.4	5.41	0-50	1155.6	11.92
50-55	745.0	7.69	0-55	1900.6	19.61
55-60	915.0	9.44	0-60	2815.6	29.05
60-65	1012.6	10.44	0-65	3828.2	39.49
65-70	1032.8	10.66	0-70	4861.0	50.15
70-75	959.4	9.90	0-75	5820.4	60.05
75-80	812.9	8.38	0-80	6633.3	68.43
80-85	696.8	7.19	0-85	7330.1	75.62
85-90	611.4	6.31	0-90	7941.5	81.93
90-95	492.9	5.08	0-95	8434.4	87.01
95-100	359.3	3.71	0-100	8793.7	90.72
100-105	228.7	2.36	0-105	9022.4	93.08
105-110	137.1	1.42	0-110	9159.5	94.50
110-115	101.4	1.04	0-115	9260.9	95.54
115-120	89.7	0.93	0-120	9350.6	96.47
120-125	83.1	0.85	0-125	9433.7	97.32
125-130	72.3	0.75	0-130	9506.0	98.07
130-135	59.3	0.61	0-135	9565.3	98.68
135-140	46.0	0.48	0-140	9611.3	99.16
140-145	32.7	0.33	0-145	9644.0	99.49
145-150	22.5	0.24	0-150	9666.5	99.73
150-155	14.3	0.14	0-155	9680.9	99.87
155-160	8.0	0.09	0-160	9688.8	99.96
160-165	3.3	0.03	0-165	9692.1	99.99
165-170	0.8	0.01	0-170	9692.9	100.00
170-175	0.1	0.00	0-175	9693.1	100.00
175-180	0.0	0.00	0-180	9693.1	100.00

6. Product Photo



Directions

1. The information marked "superscript #" is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
5. This report cannot be reproduced except in full, without prior written approval of the Company.
6. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

*****END OF REPORT*****