ANSI/IES LM-79-19

MEASUREMENT AND TEST REPORT

For

LED ONE CORPORATION

12437 Bellegrave Ave Eastvale CA US 91752

Test Model: LOC-4FTWA-MW(30/40/50/60)MCCT(35/40/50)-MS

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution
Reviewed By:	Hexy He
Report Number:	2402W65159E-EE
Test Date:	2023-12-11 to 2023-12-12
Report Date:	2024-08-26
Approved by:	Blake Zhang / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 5/F(B-West) -7/F, the 3rd Phase of Wan Li Industrial Building D, Shihua Road, Futian Free Trade Zone Shenzhen, Guangdong, China. Tel: +86-755-33320018 Fax: +86-755-33320008
Test Location 1:	Test facility was located at No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.
Test Location 2:	Test facility was located at Room 301, No.113, Pingkang Road, Dalang, Dongguan, Guangdong, China.

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.(Shenzhen). This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, or any agency of the U.S. Government. *This report contains data that are not covered by the NVLAP accreditation.

1.Product Description#

General Information:

One test sample was in good condition and received on 2023-12-04, and used for testing.

Model Tested:	LOC-4FTWA-MW(30/40/50/60)MCCT(35/40/50)-MS
Manufacturer:	LED ONE CORPORATION
Brand Name:	LEDone
Product Designation:	Stairwell and Passageway Luminaires
Burning Time Before Test:	0hour(For New Products)
Rated Voltage/Frequency:	120-347VAC 50/60Hz
White Tunable:	Yes
Field-Adjustable Light Output:	Yes

Rated Values:

Test Model	CCT(K)	Light Output (lm)	Power(W)	Luminous Efficacy (lm/W)
LOC-4FTWA-MW(30/40/50/60)MCCT(35/40/50)-MS	3500	7872	60	131.2
		6600	50	132
		5320	40	133
		4020	30	134
	4000	8400	60	140
		7050	50	141
		5680	40	142
		4290	30	143
	5000	7920	60	132
		6650	50	133
		5360	40	134
		4050	30	135

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 NVLAP accreditation scope)

Note:

1、 The applicant LED ONE CORPORATION declares that their products with model LOC-4FTWA-MW(30/40/50/60)MCCT(35/40/50)-MS are the same to the products in report# KS2231204-72447E-EE-3 and is authorized by original applicant to use their test data.

2、 All the data in previous report (KS2231204-72447E-EE-3) is shared in this report.

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	2023-09-02	2024-09-01
High-precision rapid spectral analysis system	EVERFINE	HAAS-2000	M112048CA1361125	2023-09-02	2024-09-01
Digital power meter	YOKOGAWA	WT310	13398	2023-10-13	2024-10-12
Programmable Precision DC Power Supply	EVERFINE	WY5015	11060010	2023-09-02	2024-09-01
thermometer	SENSING	N/A	N/A	2023-11-10	2024-11-09
Standard Light Source	EVERFINE	D204	N/A	2023-05-12	2025-05-11
Precision frequency power supply	ALL Power	APW-105N	970613	2023-09-02	2024-09-01
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	2023-09-02	2024-09-01
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	2023-09-02	2024-09-01
Digital power meter	YOKOGAWA	WT-210	91j926132	2023-09-02	2024-09-01
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	2023-09-02	2024-09-01
wireless remote thermohygrometer	N/A	AOK-5017B	N/A	2023-09-02	2024-09-01
Standard Light Source	EVERFINE	D908	N/A	2023-05-12	2025-05-11
Variable-Voltage Transformer	CHKO	TDGC2G-3	201102	N/A	N/A

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) 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°C±1.2°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=22K (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]

Test facility was located at Room 301, No.113, Pingkang Road, Dalang, Dongguan, Guangdong, China.

The diameter of the sphere:**1.5m**

The coating reflectance of sphere: **98%**

The Stabilization time: **30 minutes**

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

Test orientation: **Downward**

Test setting: **3500K**

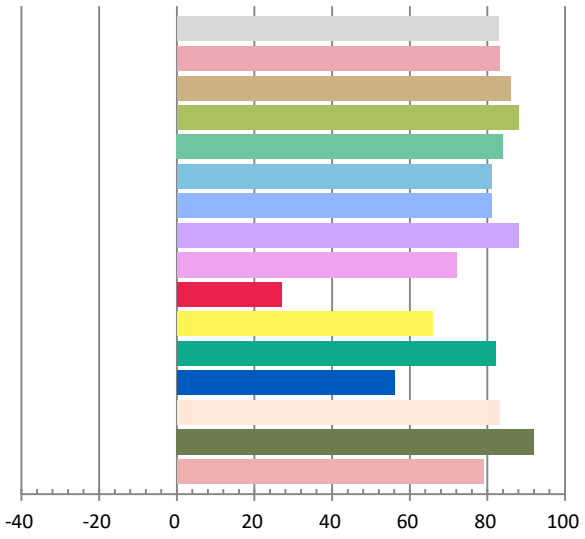
Photometric and Electrical Measurement Result

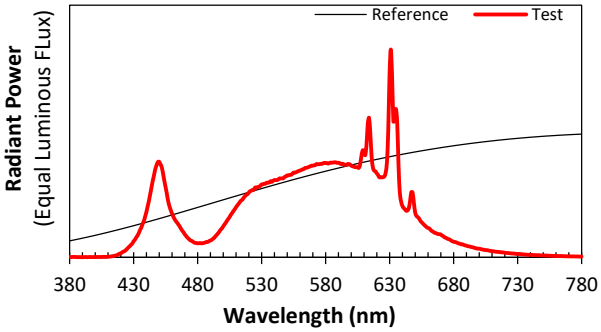
Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.4859	57.91	0.9932	7653.3	132.16

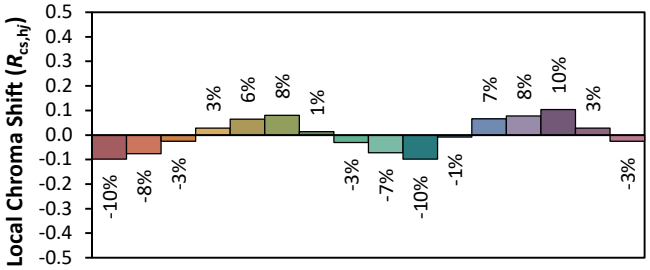
Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
22.0100	3466	0.00100	0.4083	0.3945	0.2361	0.5133

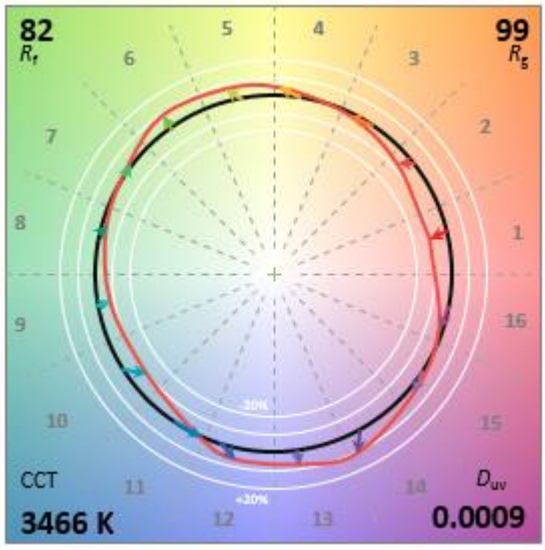
Color Rendering Index

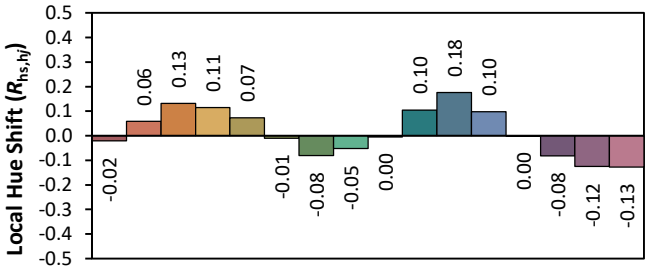
Ra			
82.8			
R1	R2	R3	R4
83.0	86	88	84
R5	R6	R7	R8
81	81	88	72
R9	R10	R11	R12
27	66	82	56
R13	R14	R15	
83	92	79	

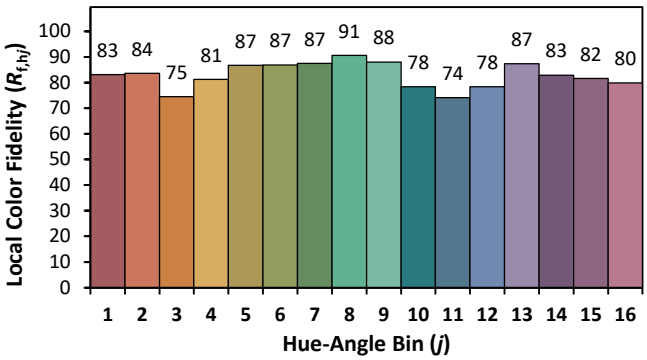


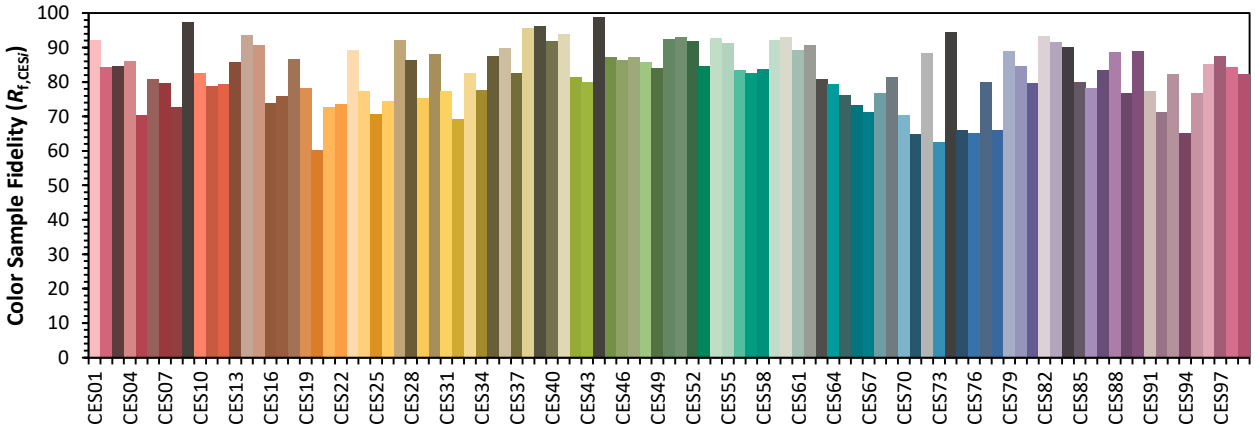

Reference
Test
Radiant Power
(Equal Luminous FLux)
380 430 480 530 580 630 680 730 780
Wavelength (nm)


Local Chroma Shift ($R_{cs,hj}$)
-10% -8% -3% 3% 6% 8% 1% -3% -7% -10% -1% 7% 8% 10% 3% -3%

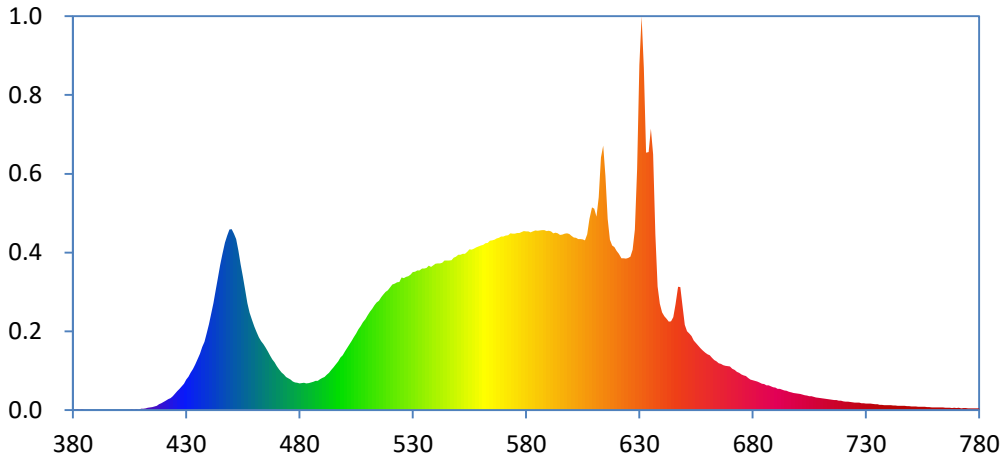

82
R_f
99
R_g
CCT
3466 K
D_{uv}
0.0009


Local Hue Shift ($R_{hs,hj}$)
-0.02 0.06 0.13 0.11 0.07 -0.01 -0.08 -0.05 0.00 0.10 0.18 0.10 0.00 -0.08 -0.12 -0.13


Local Color Fidelity ($R_{f,hj}$)
83 84 75 81 87 87 87 91 88 78 74 78 87 83 82 80
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Hue-Angle Bin (j)


Color Sample Fidelity ($R_{f,CESi}$)
CES01 CES04 CES07 CES10 CES13 CES16 CES19 CES22 CES25 CES28 CES31 CES34 CES37 CES40 CES43 CES46 CES49 CES52 CES55 CES58 CES61 CES64 CES67 CES70 CES73 CES76 CES79 CES82 CES85 CES88 CES91 CES94 CES97

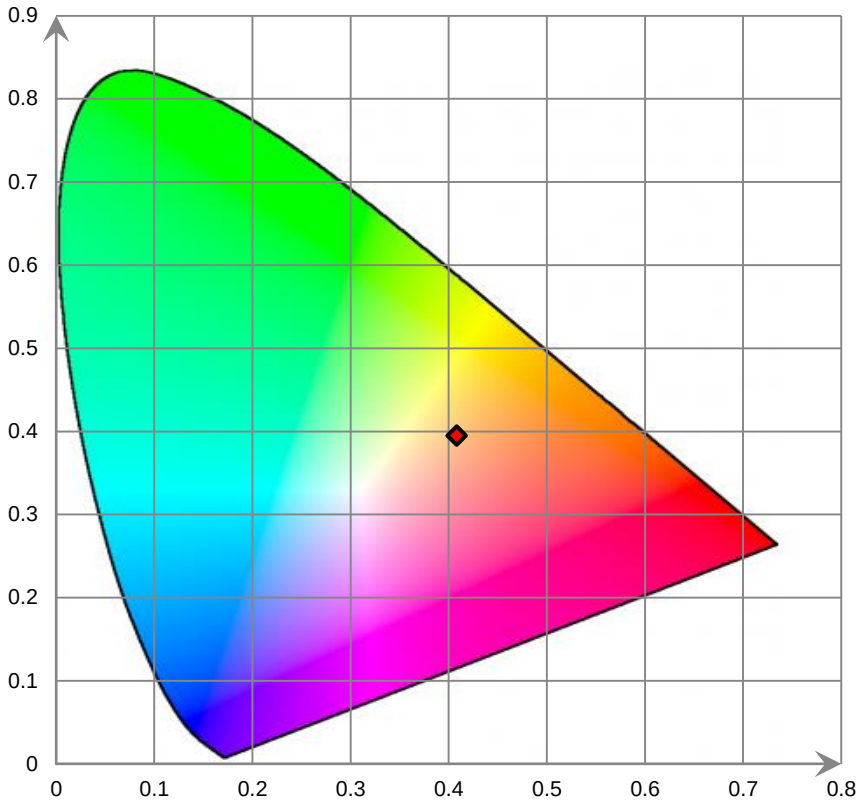
Relative Spectral Power Distribution



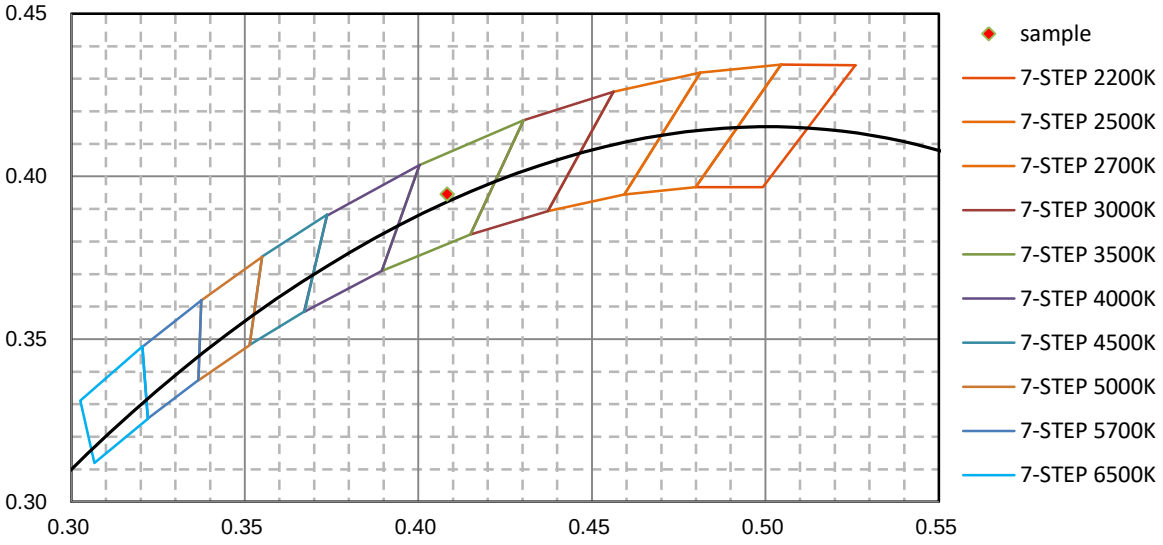
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	6.360E-01	421	6.572E+00	462	5.111E+01	503	4.873E+01	544	1.052E+02
381	2.391E-01	422	7.586E+00	463	4.846E+01	504	5.126E+01	545	1.051E+02
382	5.957E-01	423	8.321E+00	464	4.627E+01	505	5.369E+01	546	1.052E+02
383	4.723E-01	424	9.752E+00	465	4.384E+01	506	5.668E+01	547	1.053E+02
384	5.644E-01	425	1.148E+01	466	4.129E+01	507	5.901E+01	548	1.071E+02
385	4.148E-01	426	1.325E+01	467	3.825E+01	508	6.164E+01	549	1.078E+02
386	3.789E-01	427	1.485E+01	468	3.562E+01	509	6.401E+01	550	1.092E+02
387	2.302E-01	428	1.668E+01	469	3.350E+01	510	6.662E+01	551	1.092E+02
388	4.656E-01	429	1.839E+01	470	3.080E+01	511	6.911E+01	552	1.099E+02
389	1.617E-01	430	2.137E+01	471	2.857E+01	512	7.117E+01	553	1.099E+02
390	2.413E-01	431	2.333E+01	472	2.641E+01	513	7.368E+01	554	1.112E+02
391	2.622E-01	432	2.629E+01	473	2.494E+01	514	7.568E+01	555	1.130E+02
392	4.126E-01	433	2.877E+01	474	2.309E+01	515	7.679E+01	556	1.128E+02
393	4.282E-01	434	3.202E+01	475	2.219E+01	516	7.927E+01	557	1.134E+02
394	2.122E-01	435	3.610E+01	476	2.139E+01	517	8.135E+01	558	1.143E+02
395	4.404E-01	436	3.955E+01	477	2.009E+01	518	8.316E+01	559	1.150E+02
396	3.795E-01	437	4.423E+01	478	1.933E+01	519	8.414E+01	560	1.157E+02
397	4.888E-01	438	4.803E+01	479	1.910E+01	520	8.616E+01	561	1.163E+02
398	3.263E-01	439	5.403E+01	480	1.868E+01	521	8.816E+01	562	1.172E+02
399	4.653E-01	440	6.026E+01	481	1.879E+01	522	8.883E+01	563	1.176E+02
400	2.805E-01	441	6.787E+01	482	1.904E+01	523	8.988E+01	564	1.191E+02
401	5.221E-01	442	7.529E+01	483	1.865E+01	524	9.006E+01	565	1.193E+02
402	3.679E-01	443	8.418E+01	484	1.892E+01	525	9.313E+01	566	1.198E+02
403	5.160E-01	444	9.300E+01	485	1.926E+01	526	9.286E+01	567	1.206E+02
404	4.950E-01	445	1.020E+02	486	1.980E+01	527	9.373E+01	568	1.212E+02
405	3.640E-01	446	1.096E+02	487	2.053E+01	528	9.407E+01	569	1.221E+02
406	6.294E-01	447	1.177E+02	488	2.053E+01	529	9.529E+01	570	1.221E+02
407	5.250E-01	448	1.228E+02	489	2.167E+01	530	9.710E+01	571	1.227E+02
408	6.882E-01	449	1.270E+02	490	2.241E+01	531	9.725E+01	572	1.229E+02
409	4.941E-01	450	1.273E+02	491	2.321E+01	532	9.803E+01	573	1.244E+02
410	8.539E-01	451	1.241E+02	492	2.473E+01	533	9.814E+01	574	1.241E+02
411	8.913E-01	452	1.202E+02	493	2.607E+01	534	9.944E+01	575	1.241E+02
412	1.130E+00	453	1.121E+02	494	2.816E+01	535	9.941E+01	576	1.245E+02
413	1.429E+00	454	1.023E+02	495	3.000E+01	536	9.988E+01	577	1.245E+02
414	1.690E+00	455	9.377E+01	496	3.202E+01	537	1.015E+02	578	1.252E+02
415	2.120E+00	456	8.473E+01	497	3.426E+01	538	1.006E+02	579	1.259E+02
416	2.431E+00	457	7.519E+01	498	3.680E+01	539	1.018E+02	580	1.256E+02
417	2.895E+00	458	6.839E+01	499	3.857E+01	540	1.030E+02	581	1.257E+02
418	3.949E+00	459	6.306E+01	500	4.112E+01	541	1.030E+02	582	1.249E+02
419	4.754E+00	460	5.851E+01	501	4.372E+01	542	1.030E+02	583	1.256E+02
420	5.519E+00	461	5.461E+01	502	4.608E+01	543	1.036E+02	584	1.262E+02

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.261E+02	626	1.079E+02	667	3.159E+01	708	8.792E+00	749	2.589E+00
586	1.264E+02	627	1.129E+02	668	3.104E+01	709	8.611E+00	750	2.472E+00
587	1.266E+02	628	1.271E+02	669	3.085E+01	710	8.297E+00	751	2.500E+00
588	1.266E+02	629	1.696E+02	670	3.051E+01	711	8.143E+00	752	2.392E+00
589	1.258E+02	630	2.427E+02	671	2.907E+01	712	7.747E+00	753	2.325E+00
590	1.261E+02	631	2.770E+02	672	2.821E+01	713	7.573E+00	754	2.300E+00
591	1.255E+02	632	2.406E+02	673	2.676E+01	714	7.373E+00	755	2.147E+00
592	1.242E+02	633	1.810E+02	674	2.605E+01	715	7.231E+00	756	2.155E+00
593	1.247E+02	634	1.815E+02	675	2.502E+01	716	6.962E+00	757	1.960E+00
594	1.243E+02	635	1.978E+02	676	2.435E+01	717	6.893E+00	758	1.967E+00
595	1.231E+02	636	1.798E+02	677	2.377E+01	718	6.580E+00	759	1.855E+00
596	1.233E+02	637	1.236E+02	678	2.254E+01	719	6.554E+00	760	1.785E+00
597	1.241E+02	638	8.693E+01	679	2.148E+01	720	6.115E+00	761	1.795E+00
598	1.244E+02	639	7.468E+01	680	2.085E+01	721	5.851E+00	762	1.776E+00
599	1.238E+02	640	6.873E+01	681	2.051E+01	722	5.899E+00	763	1.736E+00
600	1.224E+02	641	6.584E+01	682	2.003E+01	723	5.695E+00	764	1.850E+00
601	1.213E+02	642	6.419E+01	683	1.933E+01	724	5.483E+00	765	1.584E+00
602	1.210E+02	643	6.212E+01	684	1.851E+01	725	5.244E+00	766	1.579E+00
603	1.202E+02	644	6.245E+01	685	1.820E+01	726	5.107E+00	767	1.571E+00
604	1.202E+02	645	6.524E+01	686	1.734E+01	727	5.100E+00	768	1.326E+00
605	1.200E+02	646	7.436E+01	687	1.739E+01	728	4.799E+00	769	1.472E+00
606	1.192E+02	647	8.676E+01	688	1.662E+01	729	4.587E+00	770	1.248E+00
607	1.237E+02	648	8.644E+01	689	1.599E+01	730	4.452E+00	771	1.483E+00
608	1.345E+02	649	7.299E+01	690	1.562E+01	731	4.442E+00	772	1.156E+00
609	1.425E+02	650	5.983E+01	691	1.491E+01	732	4.428E+00	773	1.260E+00
610	1.416E+02	651	5.530E+01	692	1.474E+01	733	4.267E+00	774	1.334E+00
611	1.361E+02	652	5.372E+01	693	1.423E+01	734	3.979E+00	775	1.136E+00
612	1.497E+02	653	5.190E+01	694	1.375E+01	735	3.938E+00	776	1.190E+00
613	1.776E+02	654	4.891E+01	695	1.342E+01	736	3.682E+00	777	1.171E+00
614	1.859E+02	655	4.698E+01	696	1.284E+01	737	3.581E+00	778	1.067E+00
615	1.647E+02	656	4.514E+01	697	1.241E+01	738	3.406E+00	779	9.974E-01
616	1.344E+02	657	4.343E+01	698	1.186E+01	739	3.387E+00	780	1.095E+00
617	1.197E+02	658	4.175E+01	699	1.164E+01	740	3.436E+00		
618	1.156E+02	659	4.025E+01	700	1.151E+01	741	3.356E+00		
619	1.146E+02	660	3.918E+01	701	1.121E+01	742	3.067E+00		
620	1.120E+02	661	3.856E+01	702	1.069E+01	743	3.062E+00		
621	1.099E+02	662	3.677E+01	703	1.026E+01	744	2.940E+00		
622	1.066E+02	663	3.511E+01	704	1.004E+01	745	2.988E+00		
623	1.068E+02	664	3.424E+01	705	9.701E+00	746	2.823E+00		
624	1.065E+02	665	3.284E+01	706	9.630E+00	747	2.897E+00		
625	1.069E+02	666	3.242E+01	707	9.324E+00	748	2.607E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Test facility was located at No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

The photometric distance: **2.513m**

The Stabilization time: **30 minutes**

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

Test orientation: **Downward**

Test setting: **3500K**

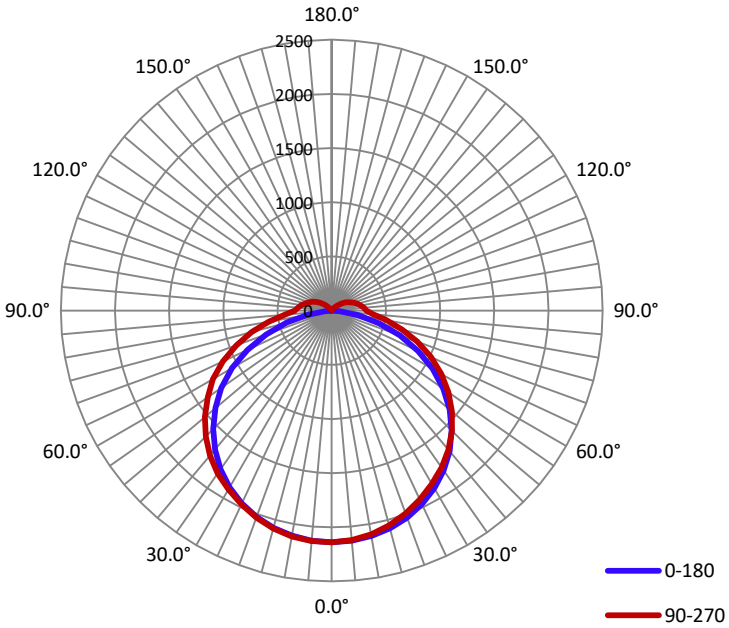
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.486	57.93	0.9933

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
7661.41	132.25	2139.0	1.31	1.33

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	119.9	126.2	129.3	126.8	125.6
Field Angle (10% I_{max}):	161.1	181.6	221.9	186.7	187.8

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0°	2138	2138	2138	2138	2138	2138	2138	2138
1°	2138	2138	2137	2137	2136	2136	2137	2137
2°	2137	2136	2135	2135	2135	2135	2135	2136
3°	2136	2135	2133	2132	2132	2132	2132	2133
4°	2134	2132	2131	2129	2129	2129	2129	2131
5°	2132	2130	2128	2125	2125	2125	2126	2128
6°	2129	2127	2124	2121	2120	2120	2122	2124
7°	2126	2123	2119	2116	2115	2115	2117	2120
8°	2122	2119	2114	2111	2109	2109	2112	2115
9°	2117	2114	2109	2105	2103	2103	2106	2110
10°	2113	2108	2102	2097	2095	2096	2099	2103
11°	2107	2102	2096	2090	2087	2088	2092	2097
12°	2101	2096	2088	2082	2079	2080	2084	2089
13°	2094	2088	2081	2073	2070	2071	2076	2082
14°	2087	2081	2072	2065	2061	2062	2068	2074
15°	2079	2072	2063	2055	2051	2052	2058	2066
16°	2071	2064	2054	2045	2040	2041	2048	2056
17°	2062	2054	2043	2034	2029	2030	2037	2046
18°	2053	2044	2032	2022	2018	2019	2026	2036
19°	2043	2034	2021	2011	2006	2007	2015	2025
20°	2032	2023	2009	1998	1993	1994	2002	2014
21°	2022	2011	1997	1985	1980	1981	1989	2001
22°	2010	1999	1984	1971	1966	1968	1976	1989
23°	1997	1986	1970	1957	1952	1953	1962	1975
24°	1985	1973	1956	1943	1938	1939	1948	1961
25°	1971	1958	1941	1928	1924	1924	1932	1946
26°	1958	1944	1926	1914	1909	1909	1917	1931
27°	1942	1928	1910	1898	1894	1894	1901	1916
28°	1927	1912	1894	1883	1879	1878	1884	1899
29°	1911	1896	1877	1867	1864	1862	1868	1882
30°	1894	1879	1860	1851	1849	1847	1850	1864
31°	1877	1861	1843	1836	1834	1831	1833	1846
32°	1859	1843	1825	1819	1818	1815	1814	1828
33°	1841	1824	1807	1803	1803	1798	1796	1808
34°	1822	1805	1787	1785	1785	1781	1777	1787
35°	1802	1784	1768	1769	1769	1764	1758	1767
36°	1781	1763	1749	1751	1751	1747	1739	1745
37°	1760	1742	1730	1733	1734	1729	1719	1724
38°	1738	1720	1709	1715	1715	1710	1699	1701
39°	1716	1698	1689	1695	1695	1690	1679	1678
40°	1693	1674	1668	1676	1676	1672	1659	1654
41°	1669	1650	1648	1655	1655	1650	1637	1630
42°	1644	1626	1627	1635	1635	1631	1617	1606
43°	1619	1602	1605	1613	1613	1608	1594	1579
44°	1593	1576	1583	1591	1592	1587	1572	1554
45°	1566	1550	1560	1569	1569	1564	1549	1527
46°	1539	1523	1536	1545	1545	1541	1525	1500
47°	1510	1496	1512	1521	1522	1517	1501	1472
48°	1482	1468	1487	1498	1498	1492	1476	1445

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
49°	1451	1438	1461	1472	1472	1467	1450	1416
50°	1421	1410	1436	1448	1448	1442	1424	1387
51°	1389	1380	1409	1420	1421	1416	1398	1358
52°	1358	1351	1382	1395	1396	1390	1370	1327
53°	1325	1320	1354	1367	1368	1363	1343	1298
54°	1292	1289	1326	1340	1342	1335	1314	1267
55°	1257	1257	1297	1312	1314	1307	1286	1236
56°	1222	1226	1268	1284	1286	1278	1256	1204
57°	1187	1193	1237	1254	1257	1250	1225	1172
58°	1151	1161	1207	1225	1228	1220	1195	1140
59°	1113	1127	1175	1194	1198	1190	1164	1107
60°	1076	1094	1144	1164	1168	1159	1132	1073
61°	1038	1059	1111	1132	1137	1129	1100	1038
62°	998	1024	1077	1099	1105	1096	1066	1002
63°	959	989	1044	1069	1074	1065	1034	969
64°	918	952	1008	1035	1041	1031	999	931
65°	878	917	976	1003	1010	999	965	895
66°	837	878	939	968	976	966	930	857
67°	796	841	905	936	944	932	895	820
68°	753	802	868	900	910	899	860	782
69°	711	764	832	867	876	864	823	743
70°	668	725	795	832	842	830	788	706
71°	628	686	759	798	808	795	751	665
72°	585	646	721	762	774	761	714	624
73°	543	607	685	728	741	727	678	588
74°	499	568	647	693	706	692	641	551
75°	455	530	612	658	673	657	606	512
76°	411	489	576	625	638	625	571	473
77°	369	449	541	592	607	593	536	434
78°	327	410	503	559	576	560	501	396
79°	286	371	468	526	544	527	465	357
80°	247	333	432	493	513	495	432	321
81°	208	295	399	461	482	464	398	285
82°	171	261	367	432	455	435	368	252
83°	137	227	336	404	427	408	339	220
84°	106	195	309	379	404	383	312	191
85°	77	166	282	355	381	360	288	165
86°	56	141	261	336	363	342	267	143
87°	36	120	243	320	347	325	250	124
88°	16	104	229	307	335	313	238	111
89°	6	92	218	298	327	305	230	103
90°	3	85	212	292	321	300	225	99
91°	1	80	207	287	316	295	221	94
92°	1	76	202	283	312	291	216	90
93°	1	72	198	278	307	286	211	86
94°	1	67	192	273	302	281	207	82
95°	1	63	188	269	298	277	202	78
96°	1	59	183	264	293	272	197	74
97°	1	55	178	259	288	267	193	70
98°	1	51	173	254	283	262	187	65

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
99°	1	47	168	248	277	257	183	61
100°	2	43	163	243	272	251	178	57
101°	2	40	158	238	267	246	172	53
102°	2	36	153	233	262	241	167	49
103°	2	33	148	227	256	235	162	45
104°	2	29	143	221	250	230	157	42
105°	2	26	138	216	245	224	151	38
106°	2	23	132	210	239	218	146	34
107°	3	20	127	204	233	212	141	31
108°	3	18	121	198	227	206	135	28
109°	3	15	116	193	221	201	130	25
110°	3	13	111	187	215	195	124	22
111°	3	11	105	181	209	189	119	19
112°	3	10	100	175	203	182	113	17
113°	4	8	94	168	196	176	107	15
114°	4	7	89	162	190	170	102	13
115°	4	7	84	156	184	164	96	11
116°	4	7	79	150	177	157	91	10
117°	4	7	73	144	171	151	85	9
118°	5	7	68	137	164	145	80	8
119°	5	7	63	131	158	138	75	8
120°	5	7	58	125	151	132	69	8
121°	5	7	53	119	145	126	64	8
122°	5	7	48	112	138	119	59	8
123°	5	7	43	106	131	113	54	8
124°	6	8	39	100	124	106	49	8
125°	6	8	35	93	118	100	44	9
126°	6	8	31	87	111	93	40	9
127°	6	8	27	81	104	87	35	9
128°	6	8	24	75	98	81	32	9
129°	7	8	21	69	91	75	28	9
130°	7	8	19	63	85	69	25	9
131°	7	8	17	57	78	63	22	9
132°	7	9	15	51	72	57	19	9
133°	7	9	14	46	65	51	17	9
134°	7	9	13	41	59	46	16	10
135°	8	9	13	36	53	41	15	10
136°	8	9	13	32	48	36	14	10
137°	8	9	13	28	42	32	14	10
138°	8	9	13	25	37	28	14	10
139°	8	9	13	22	33	24	14	10
140°	9	9	13	20	29	22	14	10
141°	9	10	13	18	25	19	14	10
142°	9	10	13	17	22	18	14	11
143°	9	10	13	16	20	17	14	11
144°	9	10	13	16	18	16	14	11
145°	10	10	13	16	17	16	14	11
146°	10	10	13	16	17	16	14	11
147°	10	10	13	16	16	16	14	11
148°	10	10	13	16	16	16	14	11

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
149°	10	10	13	15	16	16	14	11
150°	10	10	13	15	16	15	14	11
151°	10	10	13	15	16	15	14	11
152°	10	10	13	15	16	15	13	11
153°	10	11	13	15	16	15	13	10
154°	10	11	13	15	16	15	13	10
155°	10	11	13	15	15	15	13	10
156°	10	11	13	15	15	15	13	10
157°	10	11	13	15	15	15	13	10
158°	10	11	13	14	15	15	12	10
159°	10	11	13	14	15	14	12	10
160°	10	11	13	14	15	14	12	10
161°	10	11	12	14	14	14	11	10
162°	10	11	12	13	14	13	11	10
163°	10	11	12	13	14	13	11	10
164°	10	11	12	13	14	12	11	10
165°	10	11	12	13	13	12	11	10
166°	10	11	12	13	13	11	11	10
167°	10	11	12	12	13	11	11	10
168°	10	11	12	12	12	11	11	10
169°	10	11	12	12	12	11	11	10
170°	10	11	11	12	11	10	10	10
171°	11	11	11	12	10	10	10	10
172°	11	11	11	11	10	11	10	11
173°	11	11	11	11	10	11	10	10
174°	11	11	11	11	10	10	10	10
175°	10	11	11	11	10	10	10	10
176°	10	11	11	10	10	10	10	10
177°	10	11	11	10	10	10	10	10
178°	10	11	11	10	10	10	10	10
179°	10	10	10	10	11	10	10	10
180°	10	10	10	10	12	10	10	10

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0°	2138	2138	2138	2138	2138	2138	2138	2138
1°	2138	2138	2138	2139	2139	2139	2139	2138
2°	2137	2138	2138	2139	2139	2139	2139	2138
3°	2135	2136	2137	2138	2139	2139	2138	2138
4°	2133	2135	2135	2136	2137	2137	2137	2136
5°	2131	2132	2134	2134	2135	2135	2135	2135
6°	2128	2130	2131	2132	2133	2133	2133	2132
7°	2124	2127	2128	2129	2130	2130	2130	2129
8°	2120	2122	2124	2126	2126	2127	2127	2126
9°	2115	2118	2119	2120	2121	2122	2122	2121
10°	2109	2113	2114	2115	2117	2117	2118	2117
11°	2104	2107	2109	2110	2111	2112	2112	2112
12°	2097	2101	2103	2104	2105	2106	2107	2106
13°	2090	2094	2096	2097	2098	2099	2100	2100
14°	2083	2087	2088	2089	2090	2092	2093	2093
15°	2075	2079	2080	2081	2082	2084	2086	2085
16°	2067	2071	2072	2072	2074	2076	2077	2077
17°	2058	2062	2063	2064	2065	2067	2069	2069
18°	2048	2052	2053	2053	2055	2057	2060	2060
19°	2037	2042	2043	2043	2045	2047	2050	2051
20°	2026	2032	2032	2032	2034	2036	2039	2040
21°	2015	2020	2021	2021	2023	2025	2028	2029
22°	2003	2008	2009	2010	2011	2014	2017	2018
23°	1990	1995	1996	1997	1999	2002	2004	2006
24°	1976	1982	1982	1984	1986	1989	1991	1993
25°	1963	1969	1969	1970	1973	1976	1978	1980
26°	1948	1954	1955	1957	1960	1962	1964	1966
27°	1933	1939	1940	1943	1947	1949	1950	1952
28°	1918	1924	1925	1929	1934	1935	1936	1937
29°	1901	1907	1909	1915	1921	1921	1920	1921
30°	1884	1890	1892	1900	1907	1906	1904	1905
31°	1866	1873	1876	1885	1893	1892	1888	1888
32°	1848	1855	1858	1870	1879	1877	1871	1871
33°	1829	1836	1842	1855	1864	1862	1855	1852
34°	1809	1817	1824	1840	1849	1847	1837	1834
35°	1789	1797	1806	1824	1834	1831	1819	1815
36°	1767	1776	1786	1807	1818	1815	1802	1795
37°	1746	1754	1768	1790	1801	1798	1783	1775
38°	1724	1733	1748	1772	1783	1781	1765	1754
39°	1700	1710	1729	1754	1765	1762	1746	1732
40°	1676	1687	1708	1735	1746	1744	1727	1709
41°	1652	1663	1688	1716	1727	1725	1707	1687
42°	1627	1639	1667	1695	1707	1705	1688	1663
43°	1601	1614	1646	1675	1687	1685	1667	1639
44°	1575	1589	1625	1654	1666	1664	1646	1615
45°	1547	1562	1602	1632	1644	1642	1624	1590
46°	1519	1535	1579	1610	1622	1620	1601	1564
47°	1490	1508	1555	1587	1599	1598	1578	1538
48°	1460	1480	1531	1563	1576	1574	1554	1511

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
49°	1430	1451	1505	1539	1552	1551	1530	1484
50°	1399	1423	1480	1514	1528	1526	1504	1456
51°	1368	1394	1453	1489	1503	1502	1479	1428
52°	1336	1364	1427	1463	1478	1475	1453	1400
53°	1306	1334	1400	1436	1451	1450	1426	1371
54°	1275	1307	1372	1410	1425	1423	1399	1342
55°	1245	1279	1343	1382	1398	1396	1371	1315
56°	1210	1251	1317	1355	1371	1368	1343	1288
57°	1173	1219	1291	1326	1343	1341	1317	1261
58°	1136	1186	1265	1300	1317	1315	1291	1229
59°	1098	1152	1233	1274	1292	1289	1265	1196
60°	1060	1118	1201	1247	1266	1264	1234	1163
61°	1021	1083	1168	1216	1235	1232	1201	1129
62°	981	1047	1135	1185	1204	1201	1169	1094
63°	941	1012	1102	1152	1173	1169	1136	1059
64°	900	975	1067	1120	1141	1137	1103	1024
65°	859	937	1033	1086	1108	1104	1068	987
66°	817	900	997	1053	1076	1072	1034	950
67°	775	862	962	1019	1043	1037	999	912
68°	732	822	924	984	1008	1004	963	875
69°	690	784	888	949	974	968	926	837
70°	646	744	850	913	939	933	890	797
71°	603	704	813	879	905	898	853	758
72°	559	664	775	843	870	863	816	718
73°	516	623	738	808	836	828	779	679
74°	472	583	699	770	800	791	741	638
75°	429	542	662	735	765	757	703	598
76°	386	503	624	699	730	720	665	558
77°	344	462	586	663	695	686	628	518
78°	303	423	549	628	660	649	590	478
79°	263	382	511	592	625	614	554	438
80°	224	344	476	559	592	579	516	399
81°	186	307	440	524	558	545	481	361
82°	152	271	407	493	527	513	446	324
83°	118	237	374	461	495	480	412	288
84°	89	205	344	432	467	451	380	253
85°	62	176	315	404	438	421	349	221
86°	40	154	290	379	413	395	322	192
87°	28	132	267	356	390	371	295	169
88°	15	110	250	339	371	350	274	145
89°	3	97	236	323	355	333	254	122
90°	0	89	225	311	342	319	241	110
91°	0	84	219	303	332	308	230	101
92°	0	80	214	298	326	302	225	96
93°	0	75	209	293	321	297	220	92
94°	0	71	204	288	316	292	215	87
95°	1	67	199	283	311	287	210	83
96°	1	63	194	278	306	282	205	78
97°	1	58	189	272	301	277	200	74

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
98°	1	54	184	267	296	272	195	70
99°	1	50	179	262	290	267	190	65
100°	1	46	173	256	285	261	185	61
101°	2	42	168	251	279	256	179	57
102°	2	38	163	245	273	250	174	53
103°	2	35	157	239	268	244	168	49
104°	2	31	152	233	262	238	163	45
105°	2	28	146	227	256	232	157	41
106°	2	25	140	222	250	227	152	37
107°	3	22	134	216	244	221	146	33
108°	3	19	129	210	238	215	140	30
109°	3	16	123	203	231	208	134	26
110°	3	14	117	197	225	202	128	23
111°	3	12	111	191	219	196	123	20
112°	3	10	106	184	212	190	117	17
113°	4	8	100	178	205	183	111	15
114°	4	7	94	171	199	177	106	13
115°	4	7	89	165	192	170	100	11
116°	4	6	83	158	186	164	94	9
117°	4	6	78	152	179	157	88	8
118°	4	6	72	145	172	151	83	7
119°	5	6	67	138	165	144	77	6
120°	5	7	62	131	158	137	71	6
121°	5	7	56	125	151	130	66	6
122°	5	7	51	118	144	123	61	6
123°	5	7	46	111	137	116	55	7
124°	5	7	42	104	129	110	50	7
125°	6	7	37	98	123	103	45	7
126°	6	7	33	91	115	96	40	7
127°	6	8	29	85	108	90	36	7
128°	6	8	25	78	101	83	32	7
129°	6	8	22	72	95	77	27	7
130°	6	8	19	66	88	71	24	8
131°	7	8	16	60	81	64	20	8
132°	7	8	14	54	74	58	17	8
133°	7	8	13	48	68	52	15	8
134°	7	8	12	42	61	47	13	8
135°	7	8	11	37	55	41	12	8
136°	7	8	11	32	49	36	11	8
137°	7	8	11	28	43	32	11	8
138°	8	8	11	23	37	27	11	8
139°	8	8	11	20	32	23	11	8
140°	8	9	11	17	28	20	11	9
141°	8	9	11	15	23	17	11	9
142°	8	9	11	14	20	15	11	9
143°	8	9	11	13	17	14	11	9
144°	8	9	11	13	15	13	11	9
145°	8	9	11	12	14	13	11	9
146°	8	9	11	12	13	13	11	9

Luminous Intensity (cd) Distribution Data (cont.)

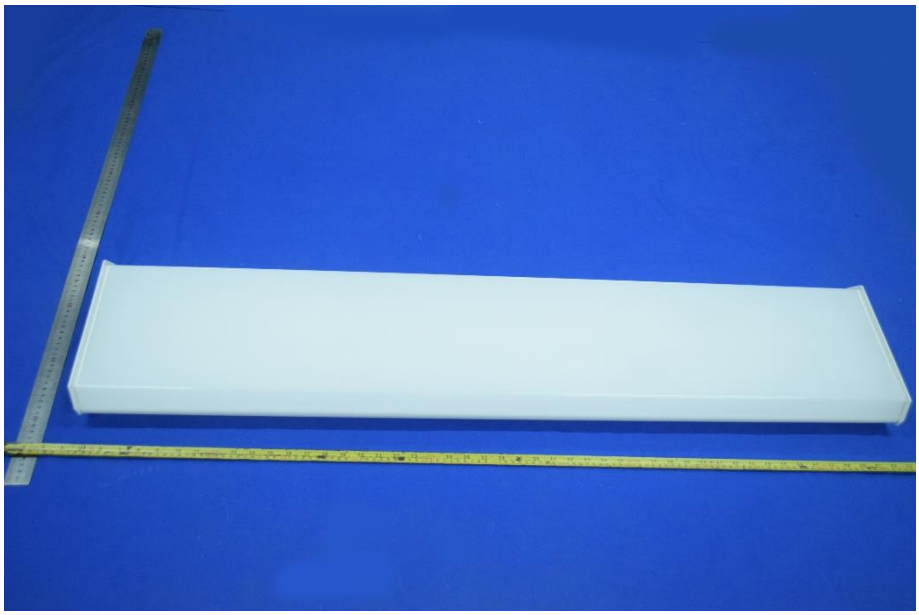
C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
147°	8	9	11	12	13	12	11	9
148°	8	8	10	12	13	12	11	9
149°	8	8	10	12	13	12	11	9
150°	9	8	10	12	13	12	11	9
151°	9	8	10	12	13	12	11	10
152°	9	8	10	12	12	12	11	10
153°	9	8	10	12	12	12	11	10
154°	9	8	10	11	12	12	11	10
155°	9	8	10	11	12	12	11	10
156°	9	8	9	11	12	12	11	10
157°	9	9	9	11	12	12	11	10
158°	9	8	9	11	12	12	11	10
159°	9	9	9	10	12	12	11	10
160°	9	9	9	10	12	12	11	10
161°	9	8	8	10	11	12	11	10
162°	9	8	8	10	11	11	11	10
163°	9	8	8	9	11	11	11	10
164°	9	9	9	9	10	11	11	10
165°	9	9	9	9	10	11	11	10
166°	9	9	9	9	10	11	11	10
167°	9	9	9	9	9	11	10	10
168°	9	9	9	9	9	11	10	10
169°	9	9	9	9	9	10	10	10
170°	9	9	9	9	9	10	10	10
171°	9	9	9	9	9	9	10	10
172°	9	10	9	9	9	9	10	10
173°	10	10	9	9	9	9	10	10
174°	10	10	10	9	9	9	10	10
175°	10	10	10	9	9	9	10	10
176°	10	10	10	9	9	9	10	10
177°	10	10	10	10	9	9	9	10
178°	10	10	10	10	9	10	9	10
179°	10	10	10	10	9	10	9	10
180°	10	10	10	10	10	11	10	10

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	51.0	0.67
5-10	151.6	1.98
10-15	248.0	3.23
15-20	337.3	4.40
20-25	417.2	5.45
25-30	485.5	6.34
30-35	541.0	7.06
35-40	581.9	7.59
40-45	606.5	7.92
45-50	613.1	8.00
50-55	601.2	7.85
55-60	571.7	7.46
60-65	522.6	6.82
65-70	454.7	5.94
70-75	372.2	4.86
75-80	281.2	3.67
80-85	191.7	2.50
85-90	126.5	1.65
90-95	102.1	1.33
95-100	90.0	1.18
100-105	77.1	1.00
105-110	63.9	0.84
110-115	51.0	0.66
115-120	39.1	0.51
120-125	28.5	0.37
125-130	19.1	0.25
130-135	11.7	0.16
135-140	6.8	0.09
140-145	4.4	0.05
145-150	3.5	0.05
150-155	3.0	0.04
155-160	2.4	0.03
160-165	1.8	0.02
165-170	1.2	0.02
170-175	0.7	0.01
175-180	0.2	0.00

Deg	Flux (lm)	%
0-5	51.0	0.67
0-10	202.7	2.65
0-15	450.6	5.88
0-20	788.0	10.28
0-25	1205.1	15.73
0-30	1690.6	22.07
0-35	2231.6	29.13
0-40	2813.5	36.72
0-45	3420.1	44.64
0-50	4033.2	52.64
0-55	4634.4	60.49
0-60	5206.1	67.95
0-65	5728.7	74.77
0-70	6183.3	80.71
0-75	6555.5	85.57
0-80	6836.7	89.24
0-85	7028.4	91.74
0-90	7154.9	93.39
0-95	7257.0	94.72
0-100	7347.0	95.90
0-105	7424.1	96.90
0-110	7488.0	97.74
0-115	7539.0	98.40
0-120	7578.1	98.91
0-125	7606.5	99.28
0-130	7625.6	99.53
0-135	7637.4	99.69
0-140	7644.2	99.78
0-145	7648.5	99.83
0-150	7652.1	99.88
0-155	7655.0	99.92
0-160	7657.4	99.95
0-165	7659.2	99.97
0-170	7660.4	99.99
0-175	7661.2	100.00
0-180	7661.4	100.00

6. Product Photo



Directions

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2. This report includes some test methods are not in NVLAP accreditation scope marked *.
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**********END OF REPORT**********