IES LM-79-08

MEASUREMENT AND TEST REPORT

For

SHENZHEN TUBU TECH CO.,LTD

Building C,Hankun Hi-tech Industrial Zone,Longteng Road,Gaoqiao District,Pingdi,Longgang,Shenzhen,Guangdong,China.

Test Model: TBG4-200W(4000K)

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution, THD
Test Engineer:	Carl Du
Report Number:	RSZ170314522-10
Test Date:	2017-03-17 to 2017-03-21
Report Date:	2017-05-12
Reviewed 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 sample was received on 2017-03-14 and used for testing.

Model Tested:	TBG4-200W(4000K)
Manufacturer:	SHENZHEN TUBU TECH CO.,LTD
Brand Name:	TUBU
Product Designation:	High-bay Luminaires for Commercial and Industrial Buildings
Burning Time Before Test:	0hour(For New Products)

Rated Values:

Rated Voltage/Frequency:	100-277 V AC 60Hz
Rated Power:	200 W
Nominal CCT:	4000K
Nominal Lumen Output:	26000 lm

2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-15: 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	Test Range	Calibration date	Calibration due date
Integrating Sphere	SENSING	N/A	N/A	25°C	2017-03-09	2018-03-08
Power Meter	EVERFINE	PF9811	G135717CN13 61159	N/A	2016-12-08	2017-12-07
High-precision rapid spectral radiometer	EVERFINE	HAAS-2000	N/A	N/A	2017-03-09	2018-03-08
AC Power Supply	ALL Power	APW-105N	970663	220V±10% 50Hz	2017-03-03	2018-03-02
Standard Light Source	EVERFINE	D204	G100283CA83 51158	24V/100W	2016-12-12	2017-12-12
Thermal Meter	SENSING	N/A	N/A	25°C	2017-03-21	2018-03-20
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2017-03-03	2018-03-02
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V， 0-300V	2017-03-03	2018-03-02
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2017-03-03	2018-03-02
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2017-03-03	2018-03-02
Goniophotometer	EVERFINE	GO-R5000	YG108492N10 120001	1600mm,3000 W/10A	2017-03-09	2018-03-08
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C;-20°C~60°C	2017-03-20	2018-03-19
Standard Light Source	EVERFINE	D908	1012003	N/A	2016-12-17	2017-12-17

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 IES LM-79-08. 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°C during measurement. And relative humidity is less than 65%.

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=1.8% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=20K (K=2), at the 95% confidence level. The uncertainty of the CRI is U=1.8(K=2), at the 95% confidence level.

The uncertainty of power meter AC current U=0.19 % of rdg, AC Voltage U=0.15% of rdg, Power U=0.20%) (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. The vertical angle (γ) test intervals were set no more than 1 degree while data for 5 degree intervals is reported. The horizontal angle (C plane) test intervals were set no more than 22.5 degree.

The uncertainty of the luminous intensity is U=1.6% (K=2) , at the 95% confidence level.

Additional Test

The Additional Test item may not be covered by IESNA LM-79-2008. Additional test including power factor, off-state power and THD, was measured by Digital Power Meter after stabilized at 25°C±1°C.Test voltage for THD and power factor test would be equal to rated voltage or, in case of a voltage range, maximum value of that range.

The uncertainty of power meter AC current U=0.19 % of rdg, AC Voltage U=0.15% of rdg, Power U=0.20%) (K=2), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_f, R_g was calculated according to IES TM-30-15 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: **Downward**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	1.707	203.9	0.9953	24735	121.3

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
77.528	4163	-0.000903	0.3729	0.3701	0.2228	0.4975

Color Rendering Index

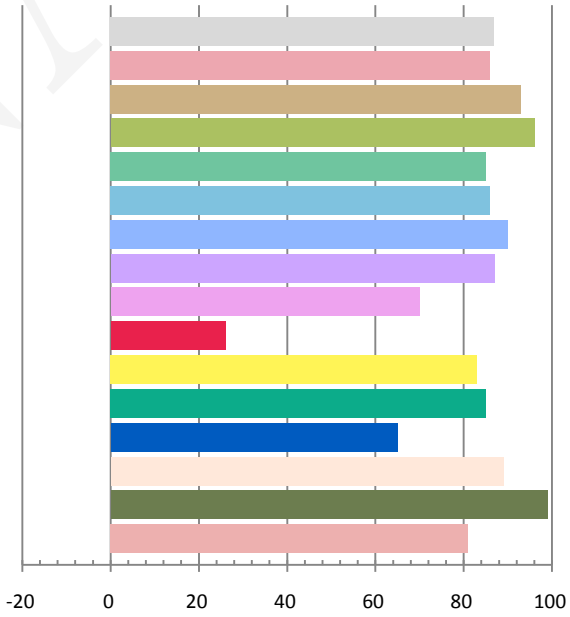
Ra
86.8

R1	R2	R3	R4
86	93	96	85

R5	R6	R7	R8
86	90	87	70

R9	R10	R11	R12
26	83	85	65

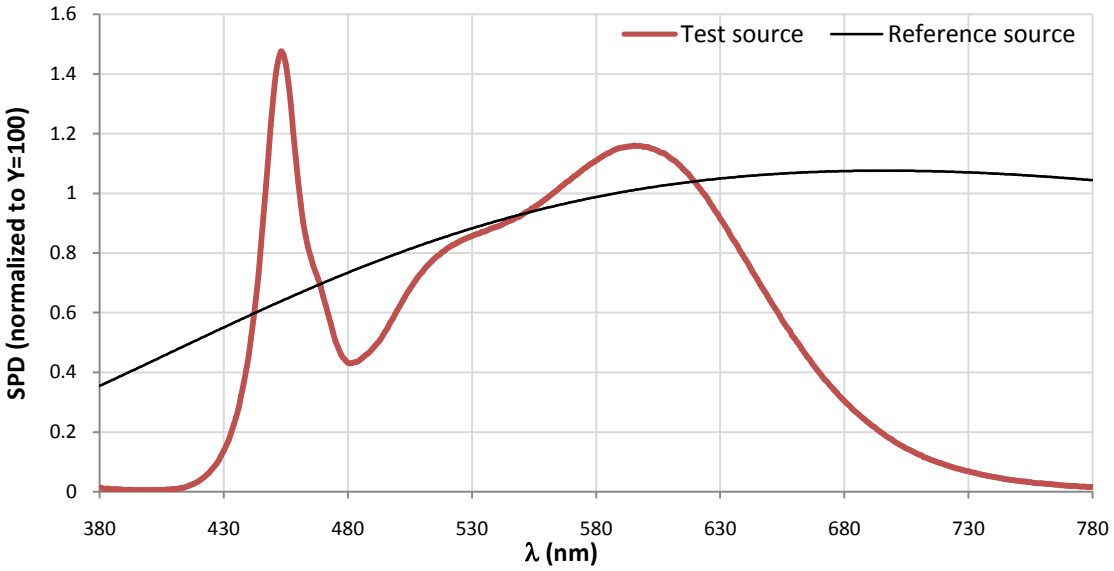
R13	R14	R15
89	99	81



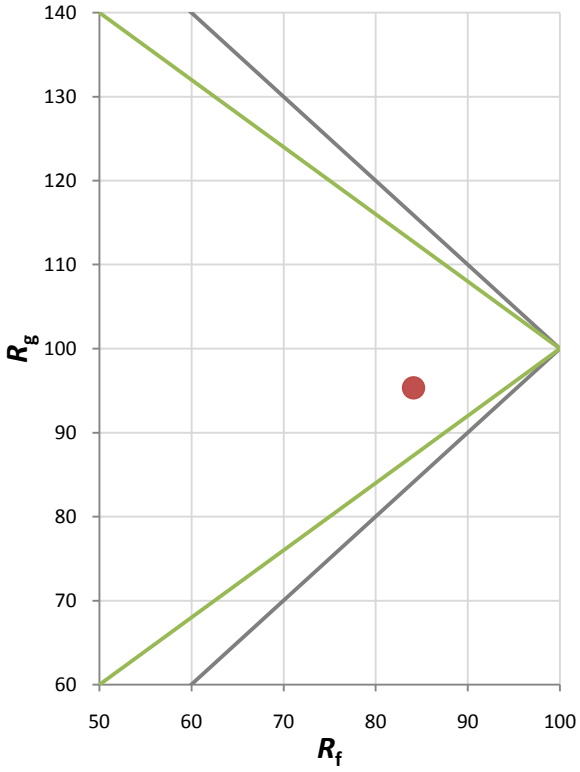
Fidelity Index and Gamut Index

Fidelity Index R_f	84
Gamut Index R_g	95

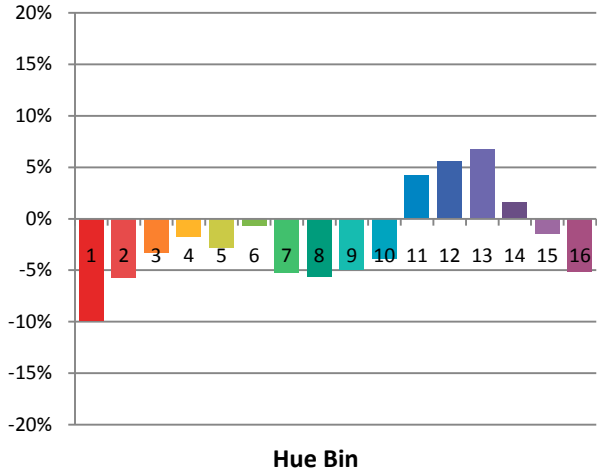
Spectral Power Distribution Comparison



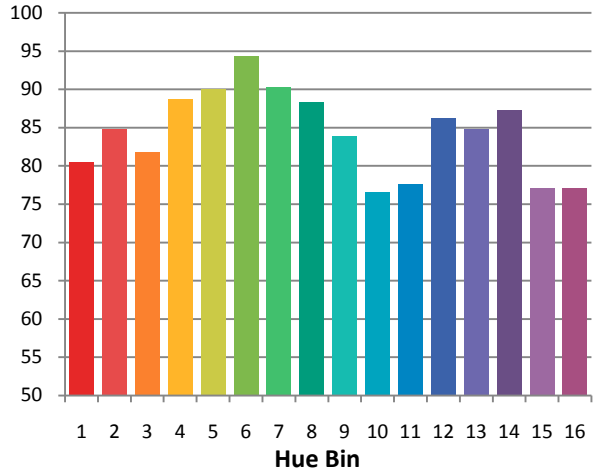
Plot of R_g versus R_f



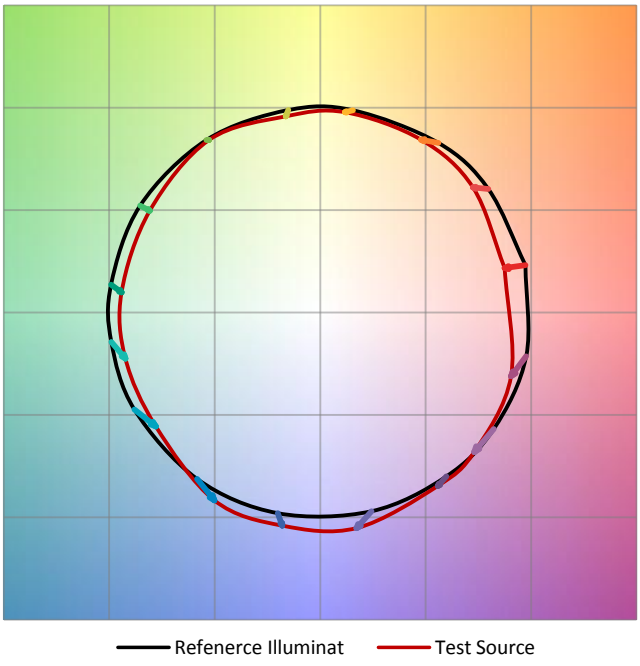
Chroma Shift by Hue



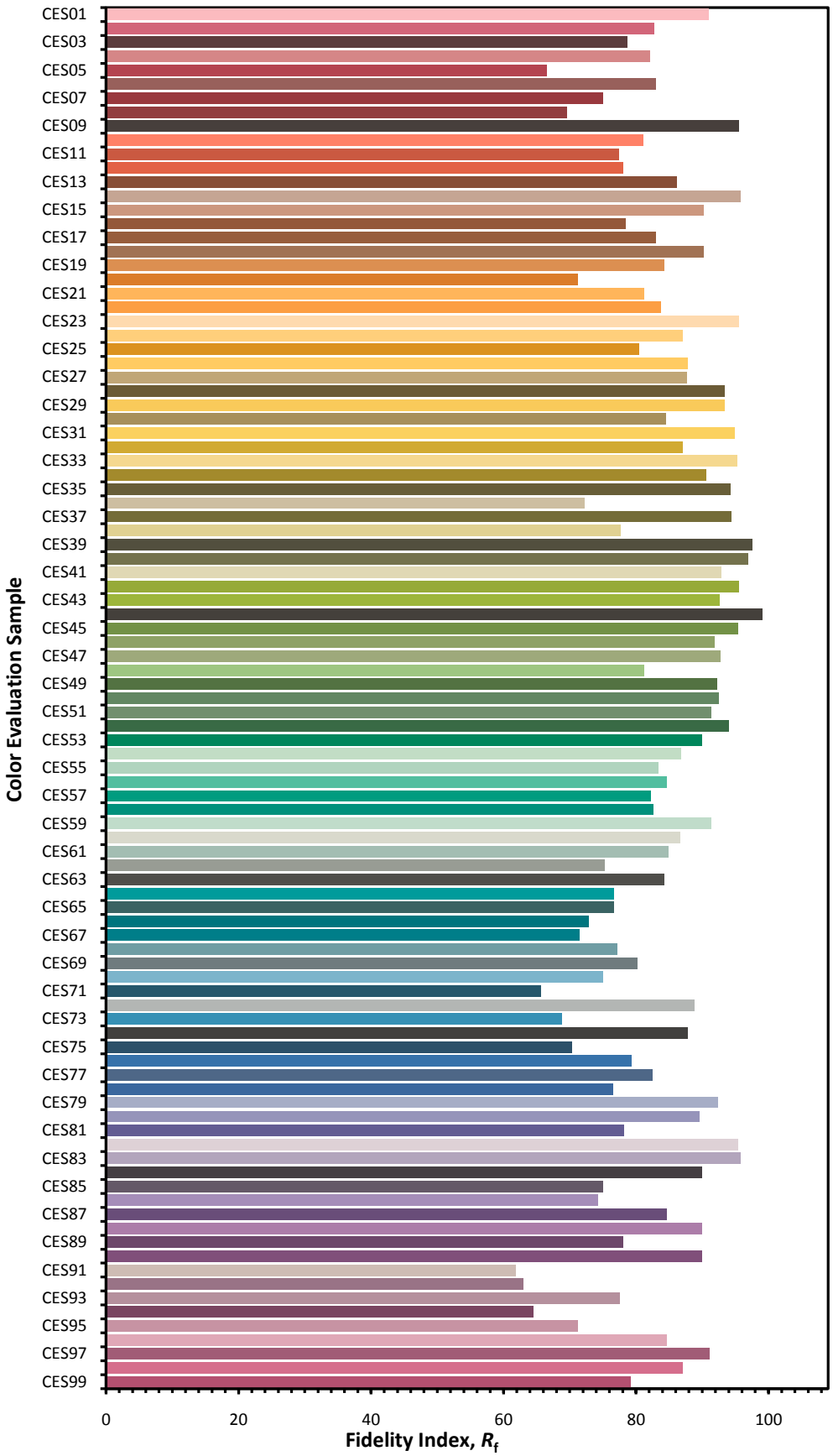
R_f by Hue



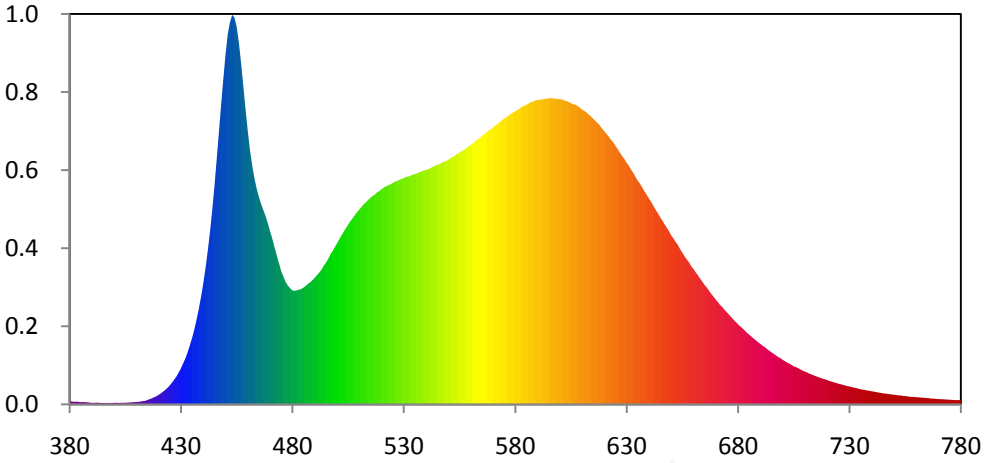
Color Vector Graphic



Color Fidelity by CES Sample



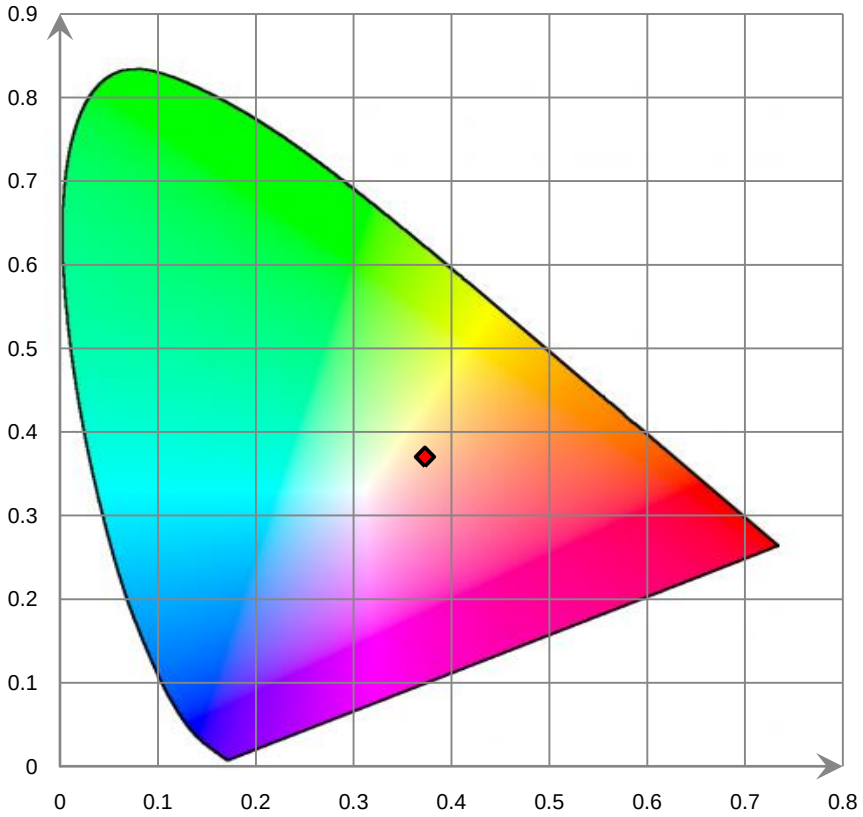
Relative Spectral Power Distribution



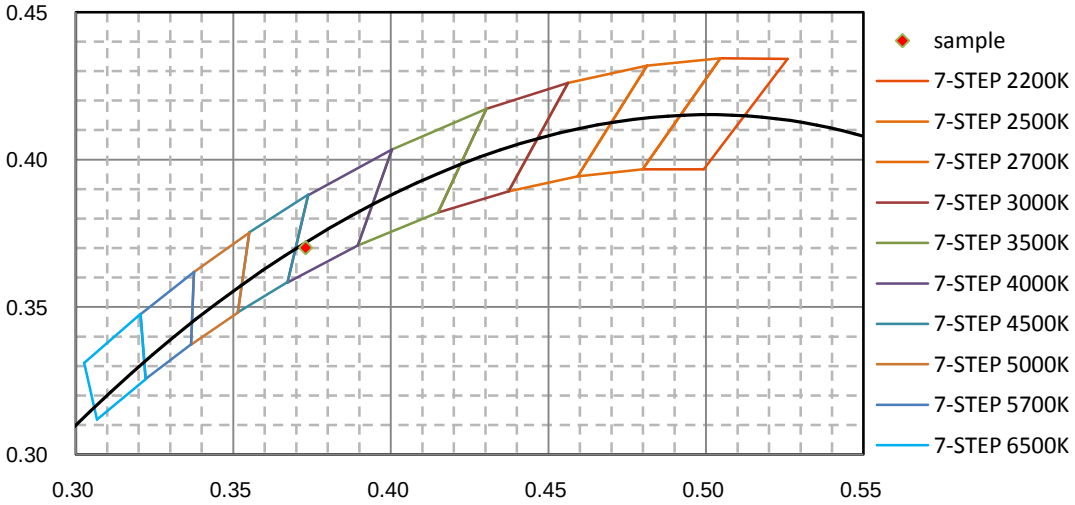
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.133E+00	421	1.511E+01	462	3.273E+02	503	2.365E+02	544	3.269E+02
381	4.134E+00	422	1.742E+01	463	3.099E+02	504	2.416E+02	545	3.286E+02
382	3.470E+00	423	1.999E+01	464	2.960E+02	505	2.463E+02	546	3.293E+02
383	3.850E+00	424	2.274E+01	465	2.845E+02	506	2.509E+02	547	3.312E+02
384	3.407E+00	425	2.619E+01	466	2.748E+02	507	2.551E+02	548	3.328E+02
385	3.127E+00	426	2.987E+01	467	2.663E+02	508	2.593E+02	549	3.337E+02
386	3.156E+00	427	3.394E+01	468	2.583E+02	509	2.635E+02	550	3.356E+02
387	3.095E+00	428	3.835E+01	469	2.484E+02	510	2.669E+02	551	3.377E+02
388	2.784E+00	429	4.369E+01	470	2.376E+02	511	2.707E+02	552	3.395E+02
389	2.532E+00	430	4.949E+01	471	2.273E+02	512	2.743E+02	553	3.410E+02
390	2.111E+00	431	5.633E+01	472	2.155E+02	513	2.771E+02	554	3.435E+02
391	1.993E+00	432	6.314E+01	473	2.045E+02	514	2.804E+02	555	3.452E+02
392	2.492E+00	433	7.147E+01	474	1.938E+02	515	2.832E+02	556	3.472E+02
393	2.161E+00	434	8.106E+01	475	1.827E+02	516	2.856E+02	557	3.489E+02
394	2.010E+00	435	9.102E+01	476	1.753E+02	517	2.876E+02	558	3.514E+02
395	1.911E+00	436	1.026E+02	477	1.679E+02	518	2.908E+02	559	3.536E+02
396	1.832E+00	437	1.160E+02	478	1.629E+02	519	2.923E+02	560	3.558E+02
397	1.803E+00	438	1.307E+02	479	1.594E+02	520	2.951E+02	561	3.580E+02
398	1.995E+00	439	1.470E+02	480	1.564E+02	521	2.971E+02	562	3.606E+02
399	1.929E+00	440	1.652E+02	481	1.557E+02	522	2.990E+02	563	3.632E+02
400	2.074E+00	441	1.860E+02	482	1.565E+02	523	3.003E+02	564	3.649E+02
401	2.230E+00	442	2.096E+02	483	1.573E+02	524	3.019E+02	565	3.678E+02
402	2.018E+00	443	2.356E+02	484	1.582E+02	525	3.035E+02	566	3.704E+02
403	2.212E+00	444	2.647E+02	485	1.602E+02	526	3.052E+02	567	3.726E+02
404	2.066E+00	445	2.978E+02	486	1.625E+02	527	3.065E+02	568	3.754E+02
405	2.280E+00	446	3.343E+02	487	1.654E+02	528	3.077E+02	569	3.772E+02
406	2.383E+00	447	3.712E+02	488	1.673E+02	529	3.091E+02	570	3.796E+02
407	2.674E+00	448	4.096E+02	489	1.704E+02	530	3.104E+02	571	3.824E+02
408	2.818E+00	449	4.454E+02	490	1.734E+02	531	3.118E+02	572	3.843E+02
409	3.077E+00	450	4.788E+02	491	1.770E+02	532	3.125E+02	573	3.868E+02
410	3.377E+00	451	5.073E+02	492	1.805E+02	533	3.134E+02	574	3.892E+02
411	3.390E+00	452	5.242E+02	493	1.844E+02	534	3.151E+02	575	3.918E+02
412	3.977E+00	453	5.342E+02	494	1.895E+02	535	3.157E+02	576	3.937E+02
413	4.541E+00	454	5.307E+02	495	1.941E+02	536	3.168E+02	577	3.959E+02
414	4.834E+00	455	5.183E+02	496	1.989E+02	537	3.183E+02	578	3.981E+02
415	6.117E+00	456	4.964E+02	497	2.052E+02	538	3.195E+02	579	4.001E+02
416	7.241E+00	457	4.681E+02	498	2.098E+02	539	3.209E+02	580	4.017E+02
417	8.411E+00	458	4.368E+02	499	2.152E+02	540	3.214E+02	581	4.039E+02
418	9.834E+00	459	4.050E+02	500	2.205E+02	541	3.225E+02	582	4.058E+02
419	1.117E+01	460	3.751E+02	501	2.259E+02	542	3.240E+02	583	4.075E+02
420	1.313E+01	461	3.488E+02	502	2.314E+02	543	3.258E+02	584	4.097E+02

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.107E+02	626	3.503E+02	667	1.561E+02	708	4.801E+01	749	1.369E+01
586	4.125E+02	627	3.454E+02	668	1.517E+02	709	4.638E+01	750	1.321E+01
587	4.144E+02	628	3.407E+02	669	1.480E+02	710	4.509E+01	751	1.281E+01
588	4.155E+02	629	3.367E+02	670	1.439E+02	711	4.409E+01	752	1.238E+01
589	4.168E+02	630	3.317E+02	671	1.404E+02	712	4.210E+01	753	1.230E+01
590	4.174E+02	631	3.273E+02	672	1.363E+02	713	4.106E+01	754	1.164E+01
591	4.179E+02	632	3.223E+02	673	1.336E+02	714	3.981E+01	755	1.144E+01
592	4.181E+02	633	3.176E+02	674	1.297E+02	715	3.857E+01	756	1.104E+01
593	4.189E+02	634	3.122E+02	675	1.264E+02	716	3.761E+01	757	1.054E+01
594	4.191E+02	635	3.069E+02	676	1.231E+02	717	3.634E+01	758	1.019E+01
595	4.199E+02	636	3.027E+02	677	1.198E+02	718	3.539E+01	759	1.022E+01
596	4.198E+02	637	2.978E+02	678	1.161E+02	719	3.449E+01	760	9.880E+00
597	4.195E+02	638	2.924E+02	679	1.132E+02	720	3.332E+01	761	9.727E+00
598	4.195E+02	639	2.878E+02	680	1.101E+02	721	3.232E+01	762	9.313E+00
599	4.187E+02	640	2.827E+02	681	1.071E+02	722	3.125E+01	763	9.224E+00
600	4.186E+02	641	2.778E+02	682	1.045E+02	723	3.036E+01	764	8.874E+00
601	4.182E+02	642	2.728E+02	683	1.015E+02	724	2.945E+01	765	8.666E+00
602	4.168E+02	643	2.672E+02	684	9.840E+01	725	2.843E+01	766	8.331E+00
603	4.159E+02	644	2.625E+02	685	9.578E+01	726	2.775E+01	767	7.931E+00
604	4.148E+02	645	2.573E+02	686	9.324E+01	727	2.692E+01	768	7.847E+00
605	4.134E+02	646	2.525E+02	687	9.043E+01	728	2.601E+01	769	7.515E+00
606	4.117E+02	647	2.474E+02	688	8.804E+01	729	2.521E+01	770	7.253E+00
607	4.110E+02	648	2.427E+02	689	8.539E+01	730	2.465E+01	771	7.118E+00
608	4.094E+02	649	2.377E+02	690	8.310E+01	731	2.384E+01	772	7.041E+00
609	4.070E+02	650	2.321E+02	691	8.052E+01	732	2.310E+01	773	6.782E+00
610	4.046E+02	651	2.278E+02	692	7.864E+01	733	2.245E+01	774	6.593E+00
611	4.026E+02	652	2.230E+02	693	7.610E+01	734	2.160E+01	775	6.349E+00
612	4.007E+02	653	2.187E+02	694	7.370E+01	735	2.085E+01	776	6.221E+00
613	3.974E+02	654	2.133E+02	695	7.155E+01	736	2.020E+01	777	6.003E+00
614	3.952E+02	655	2.082E+02	696	6.957E+01	737	1.979E+01	778	5.858E+00
615	3.918E+02	656	2.034E+02	697	6.725E+01	738	1.914E+01	779	5.901E+00
616	3.888E+02	657	1.989E+02	698	6.513E+01	739	1.859E+01	780	5.914E+00
617	3.859E+02	658	1.952E+02	699	6.354E+01	740	1.796E+01		
618	3.825E+02	659	1.896E+02	700	6.124E+01	741	1.750E+01		
619	3.782E+02	660	1.858E+02	701	5.947E+01	742	1.699E+01		
620	3.750E+02	661	1.813E+02	702	5.747E+01	743	1.621E+01		
621	3.709E+02	662	1.773E+02	703	5.600E+01	744	1.587E+01		
622	3.673E+02	663	1.727E+02	704	5.420E+01	745	1.527E+01		
623	3.630E+02	664	1.685E+02	705	5.240E+01	746	1.483E+01		
624	3.594E+02	665	1.639E+02	706	5.112E+01	747	1.445E+01		
625	3.548E+02	666	1.604E+02	707	4.973E+01	748	1.398E+01		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

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

Test orientation: **Downward**

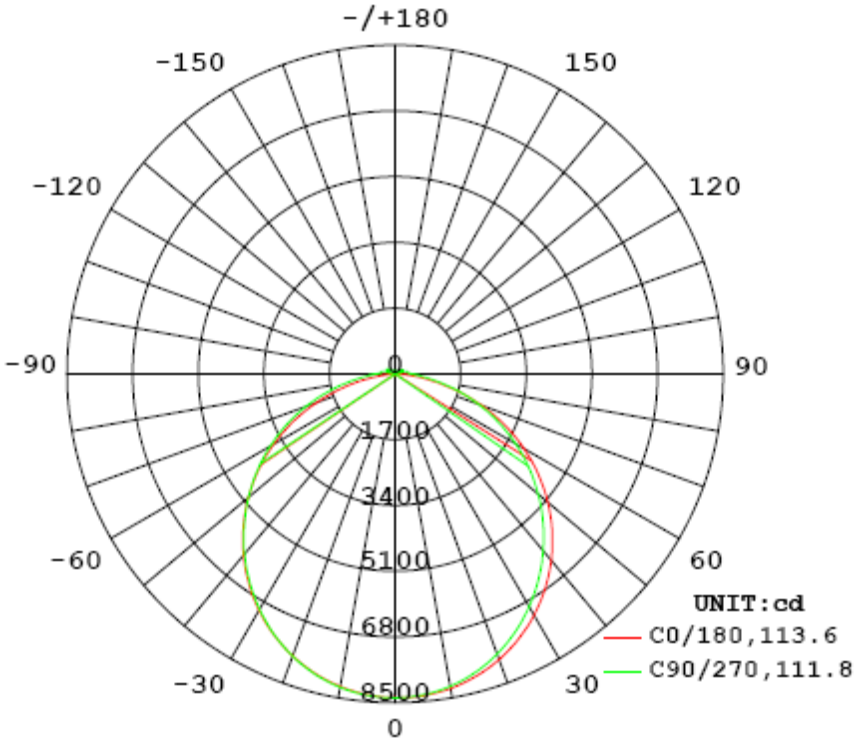
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	1.6990	202.8	0.9950

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
24885	122.68	8373.0	1.28	1.24

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	113.6	113.1	111.8	113.0	112.9
Field Angle (10% I_{max}):	159.7	163.7	166.8	163.8	163.5

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	8371	8371	8371	8371	8371	8371	8371	8371
5.0°	8323	8327	8330	8334	8338	8343	8345	8348
10.0°	8204	8212	8215	8220	8226	8236	8246	8252
15.0°	8016	8027	8028	8029	8036	8050	8073	8086
20.0°	7760	7772	7769	7762	7767	7791	7827	7849
25.0°	7440	7453	7442	7427	7430	7462	7511	7546
30.0°	7058	7071	7054	7029	7029	7070	7132	7178
35.0°	6614	6631	6608	6577	6575	6620	6695	6750
40.0°	6115	6136	6112	6075	6073	6123	6204	6264
45.0°	5565	5591	5569	5536	5534	5583	5668	5727
50.0°	4967	5003	4990	4962	4963	5012	5089	5142
55.0°	4323	4370	4375	4360	4367	4409	4473	4512
60.0°	3642	3704	3730	3733	3749	3783	3829	3843
65.0°	2923	3005	3060	3087	3108	3135	3158	3140
70.0°	2181	2285	2377	2431	2465	2479	2469	2413
75.0°	1435	1563	1695	1783	1825	1826	1780	1680
80.0°	734	884	1058	1180	1233	1215	1130	982
85.0°	182	342	563	704	765	729	610	406
90.0°	14	114	299	440	496	453	320	130
95.0°	2	54	242	348	389	353	249	92
100.0°	3	48	103	323	360	327	166	40
105.0°	3	53	31	47	142	66	4	54
110.0°	3	55	169	31	4	27	148	57
115.0°	3	55	160	236	184	210	163	58
120.0°	3	51	145	220	252	223	149	55
125.0°	4	47	129	197	225	200	134	50
130.0°	4	42	115	174	199	177	119	45
135.0°	4	37	100	152	172	154	104	40
140.0°	5	33	87	131	148	133	90	35
145.0°	6	28	74	110	125	112	76	30
150.0°	7	8	61	91	102	92	63	25
155.0°	8	8	48	72	81	73	50	8
160.0°	9	14	35	53	60	54	37	11
165.0°	9	11	9	35	40	36	9	12
170.0°	9	9	13	9	9	9	13	9
175.0°	9	8	9	9	10	10	9	9
180.0°	8	8	7	7	6	6	7	8

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	8371	8371	8371	8371	8371	8371	8371	8371
5.0°	8348	8344	8337	8331	8326	8323	8322	8323
10.0°	8254	8244	8228	8211	8199	8195	8198	8203
15.0°	8091	8075	8044	8012	7992	7989	8000	8014
20.0°	7859	7835	7788	7739	7708	7708	7730	7756
25.0°	7561	7527	7463	7396	7357	7361	7396	7431
30.0°	7197	7156	7075	6990	6942	6950	6996	7048
35.0°	6774	6726	6632	6531	6477	6487	6545	6605
40.0°	6290	6240	6133	6023	5964	5978	6040	6109
45.0°	5752	5700	5591	5477	5418	5430	5495	5563
50.0°	5165	5115	5007	4896	4836	4847	4908	4974
55.0°	4528	4485	4388	4286	4229	4236	4289	4343
60.0°	3849	3814	3735	3650	3599	3601	3638	3673
65.0°	3128	3109	3058	2993	2954	2948	2965	2975
70.0°	2381	2381	2366	2331	2304	2288	2276	2255
75.0°	1622	1648	1677	1680	1669	1642	1597	1534
80.0°	905	961	1043	1095	1104	1063	978	867
85.0°	291	384	532	635	666	616	493	325
90.0°	21	113	275	387	423	378	261	102
95.0°	1	87	226	321	353	317	221	84
100.0°	2	31	205	297	327	294	200	46
105.0°	2	44	4	190	284	190	5	45
110.0°	3	46	134	3	3	3	147	44
115.0°	3	45	142	145	46	166	140	44
120.0°	3	41	128	197	223	195	125	41
125.0°	3	36	113	175	198	173	110	36
130.0°	4	31	98	153	173	151	96	30
135.0°	4	25	83	130	148	129	82	26
140.0°	4	18	68	109	124	110	70	21
145.0°	5	12	51	86	101	91	59	18
150.0°	5	5	34	65	79	73	49	17
155.0°	6	5	19	43	57	56	39	16
160.0°	6	6	7	25	37	38	28	13
165.0°	7	6	6	12	19	21	16	6
170.0°	7	7	6	6	6	6	6	7
175.0°	7	7	7	6	6	6	6	7
180.0°	8	8	8	7	7	7	7	8

Zonal Lumen Density Measurement

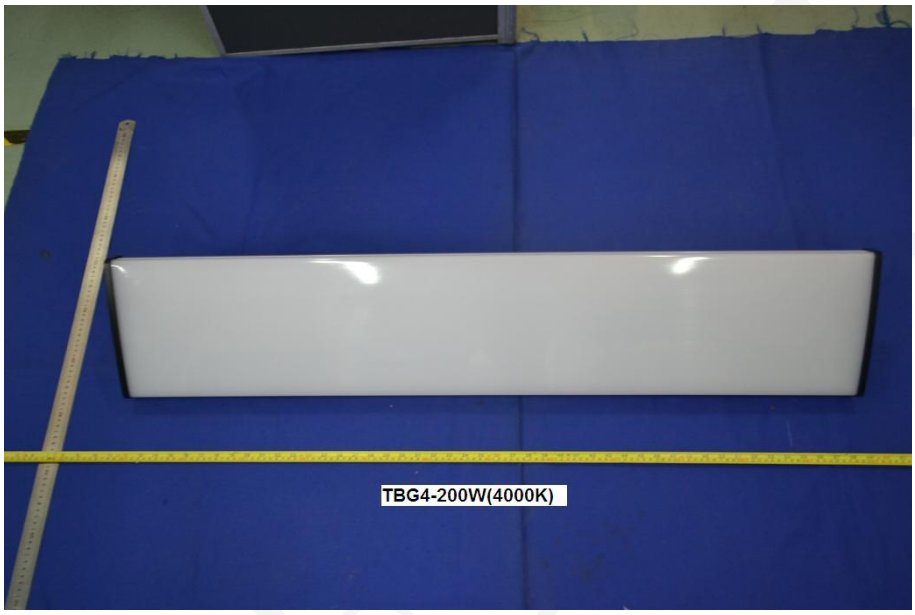
Deg	Flux (lm)	%
0-5	199.7	0.80
5-10	592.3	2.38
10-15	964.3	3.88
15-20	1303.1	5.23
20-25	1596.9	6.42
25-30	1836.4	7.38
30-35	2013.8	8.09
35-40	2124.1	8.54
40-45	2164.8	8.70
45-50	2135.0	8.58
50-55	2036.0	8.18
55-60	1871.1	7.52
60-65	1645.4	6.61
65-70	1367.0	5.49
70-75	1049.4	4.22
75-80	717.0	2.88
80-85	409.6	1.65
85-90	201.0	0.80
90-95	125.7	0.51
95-100	104.0	0.42
100-105	68.8	0.27
105-110	24.7	0.10
110-115	39.6	0.16
115-120	62.6	0.25
120-125	56.1	0.23
125-130	46.7	0.19
130-135	37.9	0.15
135-140	29.9	0.12
140-145	22.7	0.09
145-150	16.3	0.07
150-155	10.7	0.04
155-160	6.7	0.03
160-165	3.6	0.01
165-170	1.4	0.01
170-175	0.6	0.00
175-180	0.2	0.00

Deg	Flux (lm)	%
0-5	199.7	0.80
0-10	792.0	3.18
0-15	1756.3	7.06
0-20	3059.3	12.29
0-25	4656.3	18.71
0-30	6492.6	26.09
0-35	8506.4	34.18
0-40	10630.5	42.72
0-45	12795.3	51.42
0-50	14930.3	60.00
0-55	16966.2	68.18
0-60	18837.4	75.70
0-65	20482.7	82.31
0-70	21849.7	87.80
0-75	22899.2	92.02
0-80	23616.1	94.90
0-85	24025.8	96.55
0-90	24226.8	97.35
0-95	24352.5	97.86
0-100	24456.5	98.28
0-105	24525.4	98.55
0-110	24550.0	98.65
0-115	24589.7	98.81
0-120	24652.2	99.06
0-125	24708.3	99.29
0-130	24755.1	99.48
0-135	24793.0	99.63
0-140	24822.9	99.75
0-145	24845.5	99.84
0-150	24861.9	99.91
0-155	24872.6	99.95
0-160	24879.3	99.98
0-165	24882.9	99.99
0-170	24884.3	100.00
0-175	24884.9	100.00
0-180	24885.0	100.00

[Additional Test]

Test Item	Test Voltage (V)	Frequency (Hz)	Test Result
Power Factor:	277.0	60	0.9223
Total Harmonic Distortion:	277.0	60	6.02%
Total Harmonic Distortion:	120.0	60	5.65%
Total Harmonic Distortion:	100.0	60	5.13%
Power Factor:	100.0	60	0.9968

6. Product Photo



7. Product Test orientation in the Goniophotometer

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