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: LHB-150W(4000K)

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution, THD
Test Engineer:	Carl Du Carl Du
Report Number:	RSZ170208501-10
Test Date:	2017-02-10
Report Date:	2017-03-10
Reviewed By:	Blake Zhang / EE Engineer Blake Zhang
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 2017-02-08 and used for testing.

Model Tested:	LHB-150W(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 50/60Hz
Rated Power:	150 W
Nominal CCT:	4000K
Nominal Lumen Output:	19500 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	SPR-600	S09008	25～50°C	2017-03-09	2018-03-08
High Accuracy Array spectroradiometer	EVERFINE	HAAS-2000	M112048CA1361125	380-780nm	2016-07-08	2017-07-07
Power meter	YOKOGAWA	WT310	C20E17024V	2kV/20A	2016-07-08	2017-07-07
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2017-03-03	2018-03-02
Thermal Meter	SENSING	N/A	N/A	25、50°C	2017-03-09	2018-03-08
Standard Light Source	SENSING	N/A	LSD090808	N/A	2016-12-05	2017-12-04
AC Power Supply	ALL Power	APW-105N	970613	220V±10% 50Hz	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	YG108492N10120001	1600mm,3000W/10A	2017-03-09	2018-03-08
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C;-20°C~60°C	2016-03-21	2017-03-20

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Standard Light Source	EVERFINE	D908	1012003	N/A	2016-09-07	2017-09-06

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=2.1% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=32K (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=0.19 % 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

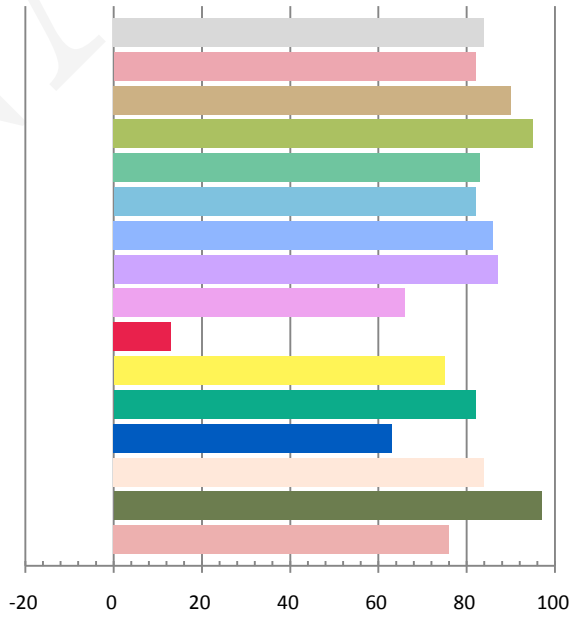
Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	1.257	150	0.9948	20677	137.84

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
62.916	3989	0.00105	0.3817	0.3798	0.2247	0.5031

Color Rendering Index

Ra
84.0

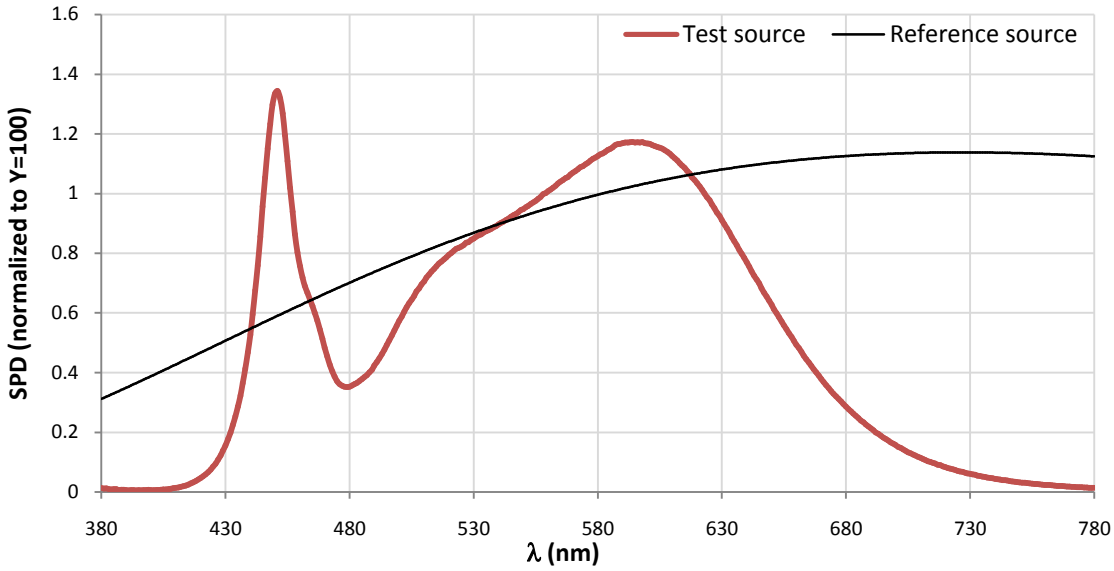
R1	R2	R3	R4
82	90	95	83
R5	R6	R7	R8
82	86	87	66
R9	R10	R11	R12
13	75	82	63
R13	R14	R15	
84	97	76	



Fidelity Index and Gamut Index

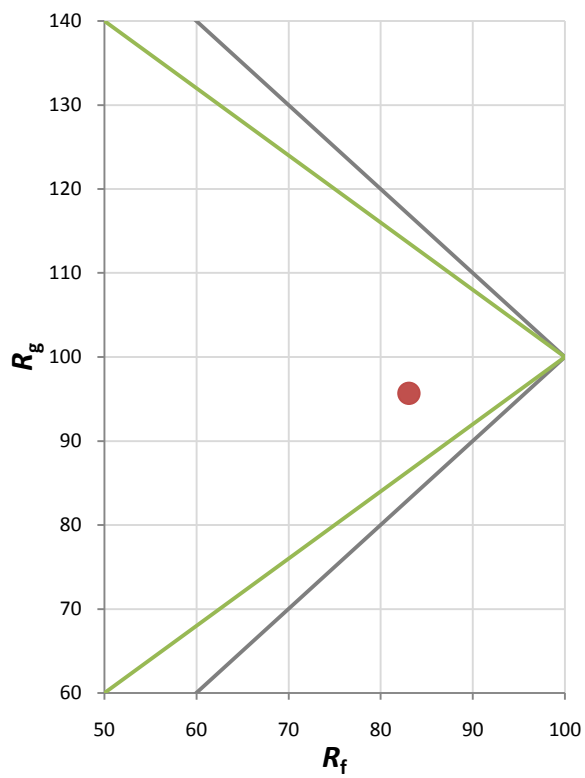
Fidelity Index R_f	83
Gamut Index R_g	96

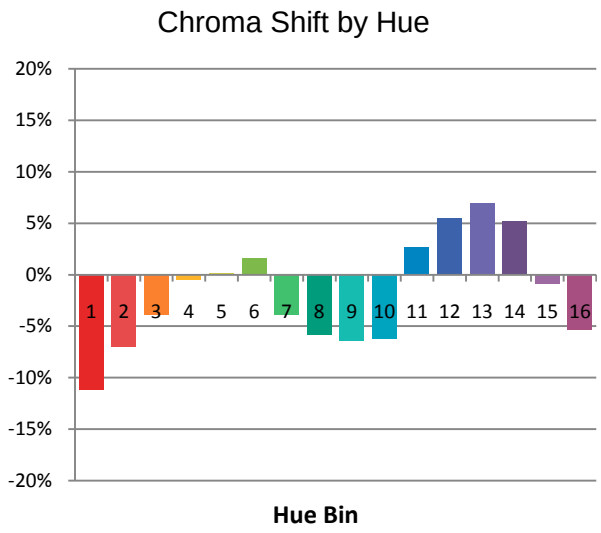
Spectral Power Distribution Comparison

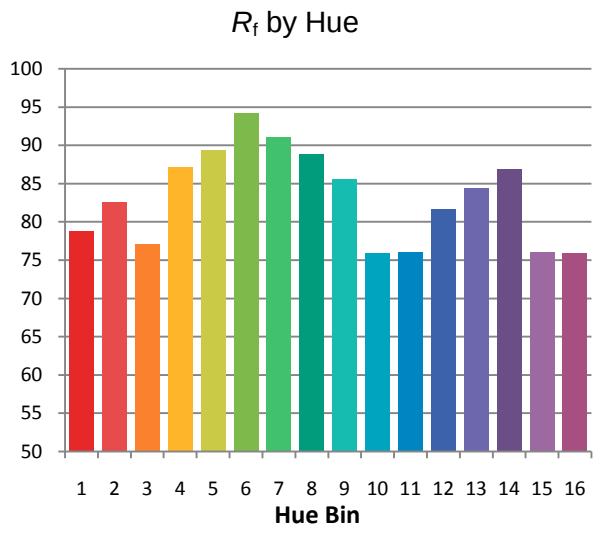


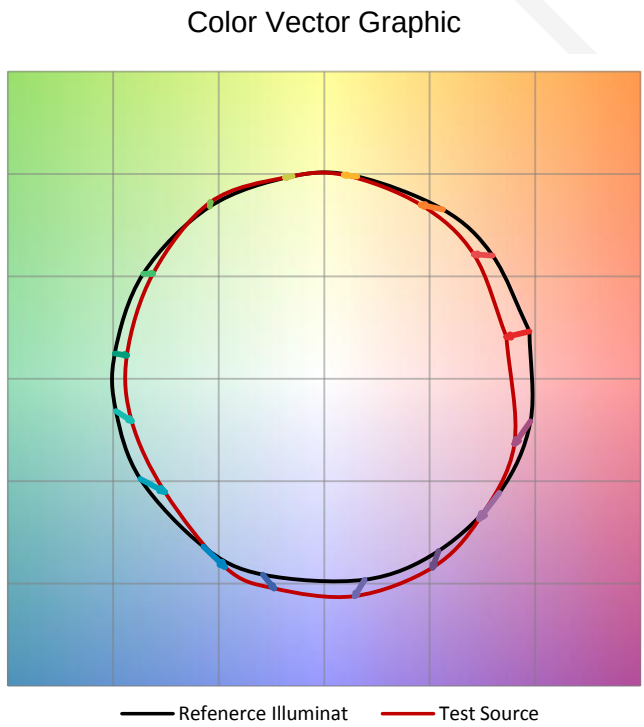
b

Plot of R_g versus R_f

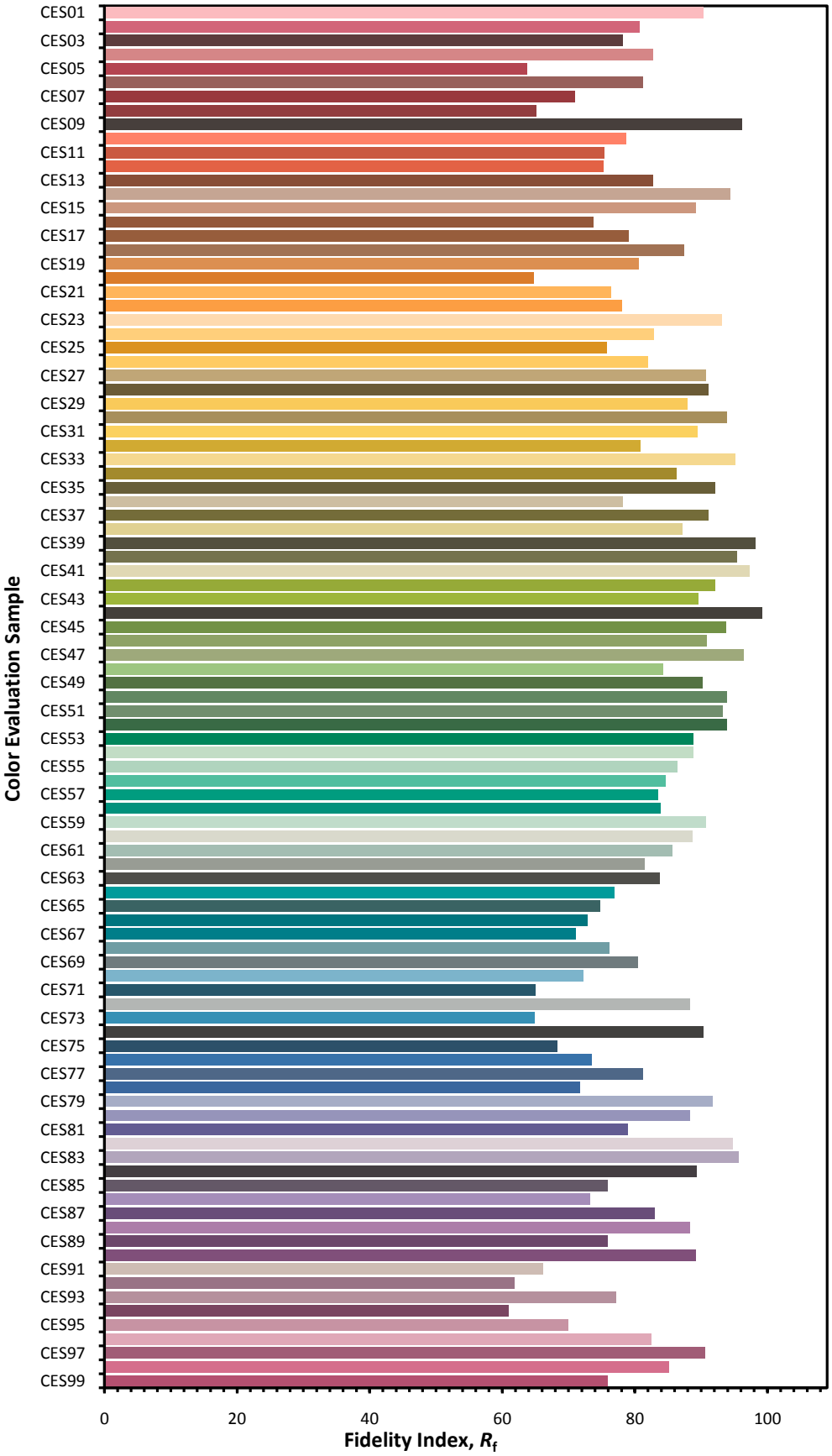



Chroma Shift by Hue
20%
15%
10%
5%
0%
-5%
-10%
-15%
-20%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Hue Bin

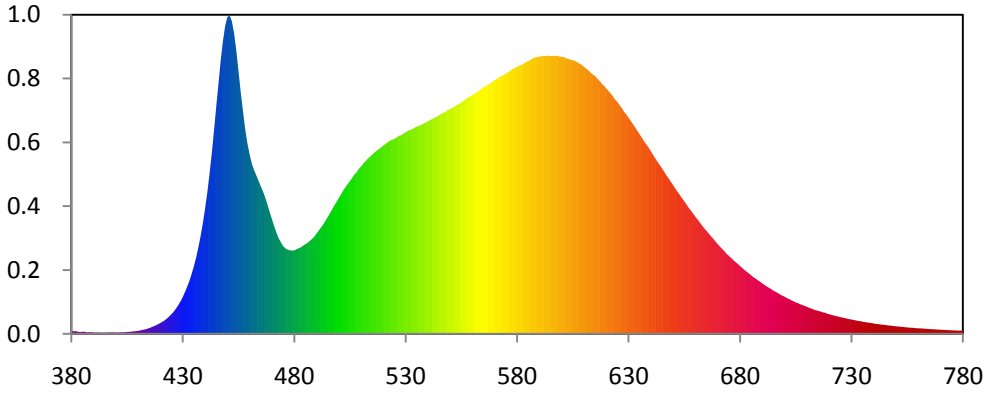

R_f by Hue
100
95
90
85
80
75
70
65
60
55
50
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Hue Bin


Color Vector Graphic
Refenerce Illuminat
Test Source

Color Fidelity by CES Sample



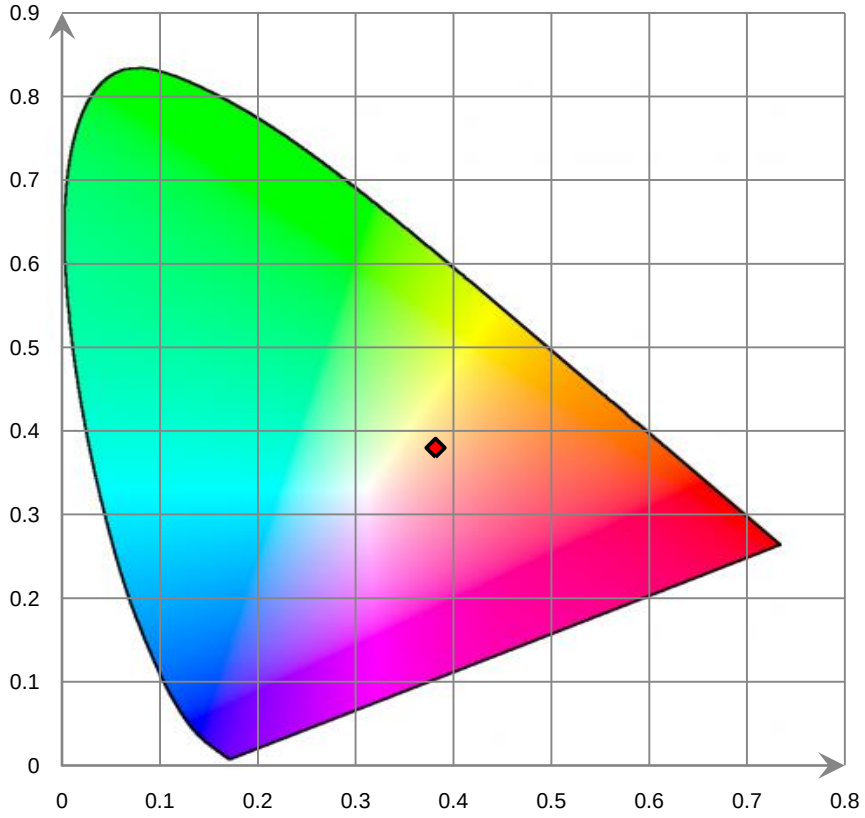
Relative Spectral Power Distribution



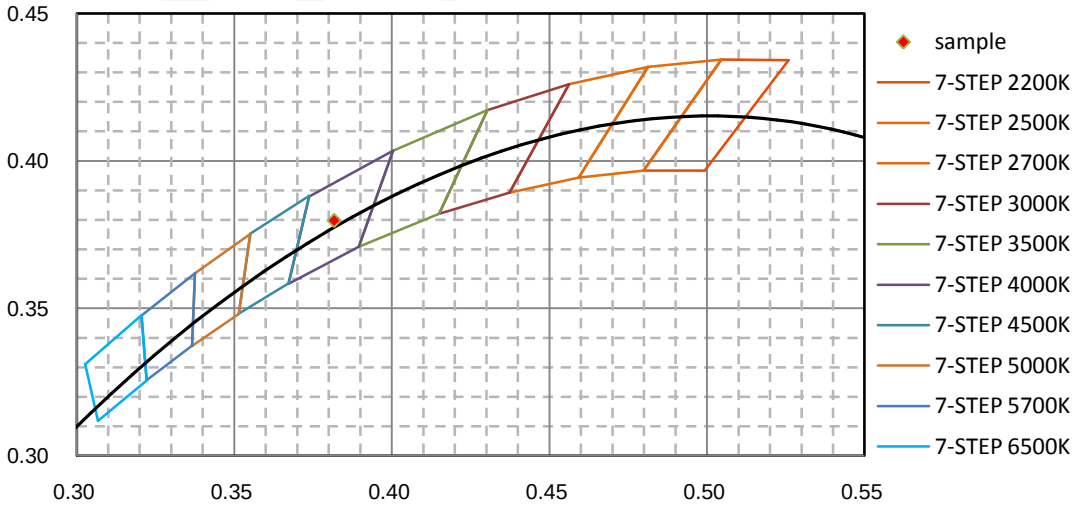
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	4.326E+00	421	1.578E+01	462	2.090E+02	503	1.872E+02	544	2.771E+02
381	3.451E+00	422	1.769E+01	463	2.022E+02	504	1.915E+02	545	2.791E+02
382	3.632E+00	423	1.997E+01	464	1.955E+02	505	1.952E+02	546	2.806E+02
383	2.803E+00	424	2.261E+01	465	1.885E+02	506	1.990E+02	547	2.821E+02
384	2.474E+00	425	2.557E+01	466	1.817E+02	507	2.034E+02	548	2.836E+02
385	2.878E+00	426	2.867E+01	467	1.741E+02	508	2.064E+02	549	2.858E+02
386	2.792E+00	427	3.263E+01	468	1.649E+02	509	2.107E+02	550	2.870E+02
387	1.954E+00	428	3.686E+01	469	1.555E+02	510	2.137E+02	551	2.887E+02
388	2.296E+00	429	4.169E+01	470	1.465E+02	511	2.175E+02	552	2.903E+02
389	2.183E+00	430	4.717E+01	471	1.377E+02	512	2.205E+02	553	2.922E+02
390	1.950E+00	431	5.365E+01	472	1.293E+02	513	2.235E+02	554	2.937E+02
391	1.733E+00	432	6.050E+01	473	1.223E+02	514	2.262E+02	555	2.954E+02
392	1.922E+00	433	6.787E+01	474	1.171E+02	515	2.287E+02	556	2.973E+02
393	1.803E+00	434	7.673E+01	475	1.123E+02	516	2.316E+02	557	2.994E+02
394	1.575E+00	435	8.653E+01	476	1.094E+02	517	2.338E+02	558	3.021E+02
395	1.808E+00	436	9.765E+01	477	1.076E+02	518	2.359E+02	559	3.031E+02
396	1.705E+00	437	1.105E+02	478	1.067E+02	519	2.380E+02	560	3.050E+02
397	2.053E+00	438	1.248E+02	479	1.064E+02	520	2.404E+02	561	3.066E+02
398	1.882E+00	439	1.414E+02	480	1.067E+02	521	2.425E+02	562	3.085E+02
399	2.087E+00	440	1.597E+02	481	1.080E+02	522	2.447E+02	563	3.105E+02
400	1.834E+00	441	1.801E+02	482	1.093E+02	523	2.467E+02	564	3.129E+02
401	1.783E+00	442	2.044E+02	483	1.106E+02	524	2.478E+02	565	3.148E+02
402	2.075E+00	443	2.299E+02	484	1.126E+02	525	2.490E+02	566	3.163E+02
403	2.089E+00	444	2.591E+02	485	1.145E+02	526	2.507E+02	567	3.184E+02
404	2.161E+00	445	2.896E+02	486	1.164E+02	527	2.529E+02	568	3.194E+02
405	2.623E+00	446	3.190E+02	487	1.186E+02	528	2.535E+02	569	3.220E+02
406	2.724E+00	447	3.483E+02	488	1.213E+02	529	2.558E+02	570	3.238E+02
407	3.023E+00	448	3.733E+02	489	1.241E+02	530	2.572E+02	571	3.255E+02
408	3.250E+00	449	3.926E+02	490	1.281E+02	531	2.591E+02	572	3.274E+02
409	3.716E+00	450	4.041E+02	491	1.319E+02	532	2.603E+02	573	3.294E+02
410	4.046E+00	451	4.066E+02	492	1.357E+02	533	2.613E+02	574	3.304E+02
411	4.588E+00	452	3.991E+02	493	1.399E+02	534	2.633E+02	575	3.325E+02
412	5.191E+00	453	3.840E+02	494	1.444E+02	535	2.644E+02	576	3.339E+02
413	5.831E+00	454	3.618E+02	495	1.491E+02	536	2.656E+02	577	3.358E+02
414	6.621E+00	455	3.356E+02	496	1.539E+02	537	2.669E+02	578	3.379E+02
415	7.532E+00	456	3.083E+02	497	1.588E+02	538	2.684E+02	579	3.393E+02
416	8.788E+00	457	2.844E+02	498	1.638E+02	539	2.696E+02	580	3.409E+02
417	9.831E+00	458	2.615E+02	499	1.685E+02	540	2.713E+02	581	3.423E+02
418	1.111E+01	459	2.432E+02	500	1.735E+02	541	2.731E+02	582	3.433E+02
419	1.261E+01	460	2.290E+02	501	1.779E+02	542	2.742E+02	583	3.450E+02
420	1.413E+01	461	2.173E+02	502	1.832E+02	543	2.758E+02	584	3.469E+02

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.480E+02	626	2.918E+02	667	1.247E+02	708	3.692E+01	749	1.013E+01
586	3.496E+02	627	2.879E+02	668	1.214E+02	709	3.573E+01	750	9.762E+00
587	3.517E+02	628	2.833E+02	669	1.180E+02	710	3.466E+01	751	9.532E+00
588	3.527E+02	629	2.801E+02	670	1.146E+02	711	3.345E+01	752	9.305E+00
589	3.531E+02	630	2.758E+02	671	1.115E+02	712	3.241E+01	753	9.032E+00
590	3.538E+02	631	2.717E+02	672	1.084E+02	713	3.122E+01	754	8.646E+00
591	3.545E+02	632	2.676E+02	673	1.055E+02	714	3.034E+01	755	8.354E+00
592	3.545E+02	633	2.633E+02	674	1.023E+02	715	2.951E+01	756	8.098E+00
593	3.546E+02	634	2.588E+02	675	9.963E+01	716	2.875E+01	757	7.985E+00
594	3.551E+02	635	2.545E+02	676	9.712E+01	717	2.766E+01	758	7.756E+00
595	3.544E+02	636	2.503E+02	677	9.429E+01	718	2.725E+01	759	7.372E+00
596	3.548E+02	637	2.455E+02	678	9.172E+01	719	2.591E+01	760	7.268E+00
597	3.543E+02	638	2.418E+02	679	8.926E+01	720	2.526E+01	761	7.109E+00
598	3.549E+02	639	2.376E+02	680	8.679E+01	721	2.434E+01	762	6.966E+00
599	3.539E+02	640	2.331E+02	681	8.413E+01	722	2.367E+01	763	6.694E+00
600	3.534E+02	641	2.285E+02	682	8.165E+01	723	2.293E+01	764	6.472E+00
601	3.531E+02	642	2.240E+02	683	7.947E+01	724	2.224E+01	765	6.246E+00
602	3.518E+02	643	2.195E+02	684	7.715E+01	725	2.152E+01	766	6.152E+00
603	3.507E+02	644	2.156E+02	685	7.494E+01	726	2.087E+01	767	6.023E+00
604	3.500E+02	645	2.115E+02	686	7.242E+01	727	2.034E+01	768	5.744E+00
605	3.491E+02	646	2.068E+02	687	7.058E+01	728	1.954E+01	769	5.602E+00
606	3.482E+02	647	2.023E+02	688	6.852E+01	729	1.892E+01	770	5.449E+00
607	3.466E+02	648	1.983E+02	689	6.666E+01	730	1.851E+01	771	5.287E+00
608	3.449E+02	649	1.940E+02	690	6.453E+01	731	1.774E+01	772	5.103E+00
609	3.431E+02	650	1.898E+02	691	6.263E+01	732	1.736E+01	773	4.940E+00
610	3.409E+02	651	1.852E+02	692	6.051E+01	733	1.661E+01	774	4.838E+00
611	3.385E+02	652	1.814E+02	693	5.898E+01	734	1.635E+01	775	4.721E+00
612	3.362E+02	653	1.771E+02	694	5.711E+01	735	1.564E+01	776	4.602E+00
613	3.334E+02	654	1.731E+02	695	5.515E+01	736	1.522E+01	777	4.482E+00
614	3.309E+02	655	1.692E+02	696	5.379E+01	737	1.467E+01	778	4.332E+00
615	3.289E+02	656	1.652E+02	697	5.218E+01	738	1.433E+01	779	4.319E+00
616	3.256E+02	657	1.609E+02	698	5.037E+01	739	1.396E+01	780	4.327E+00
617	3.228E+02	658	1.573E+02	699	4.893E+01	740	1.340E+01		
618	3.191E+02	659	1.534E+02	700	4.754E+01	741	1.289E+01		
619	3.166E+02	660	1.494E+02	701	4.575E+01	742	1.263E+01		
620	3.133E+02	661	1.460E+02	702	4.461E+01	743	1.215E+01		
621	3.099E+02	662	1.421E+02	703	4.306E+01	744	1.183E+01		
622	3.067E+02	663	1.383E+02	704	4.173E+01	745	1.153E+01		
623	3.029E+02	664	1.346E+02	705	4.026E+01	746	1.110E+01		
624	2.989E+02	665	1.314E+02	706	3.933E+01	747	1.076E+01		
625	2.959E+02	666	1.279E+02	707	3.795E+01	748	1.048E+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**

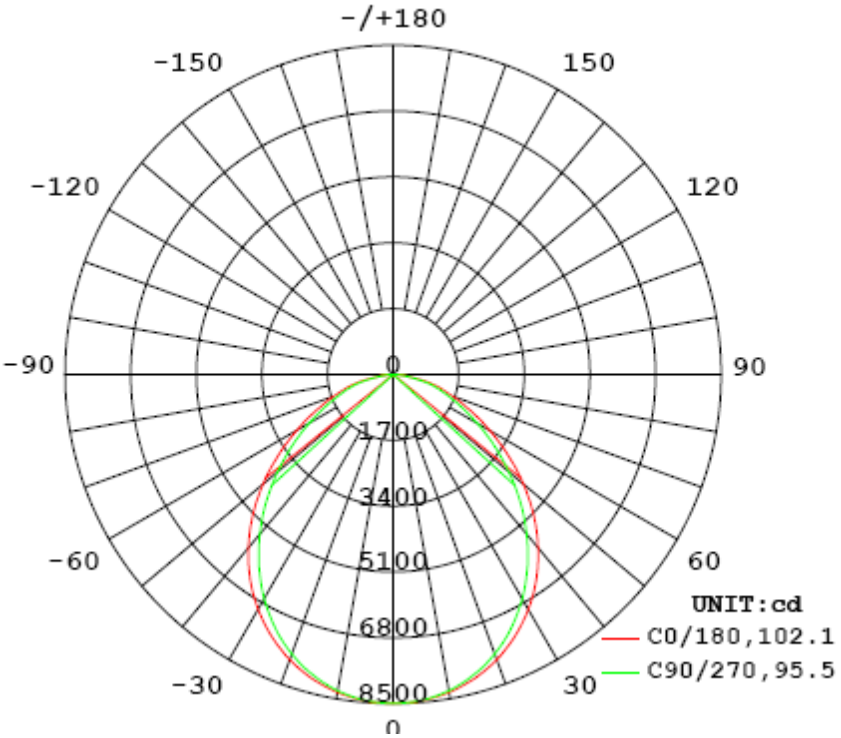
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60	1.2530	149.6	0.9945

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
20687.1	138.28	8491.0	1.23	1.18

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	102.1	98.6	95.5	98.6	98.7
Field Angle (10% I_{max}):	156.0	156.4	153.2	156.4	155.5

Luminous Intensity (cd) Distribution Data

γ \ C	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	8491	8491	8491	8491	8491	8491	8491	8491
5.0°	8451	8450	8446	8443	8441	8443	8446	8450
10.0°	8331	8326	8311	8297	8290	8297	8311	8326
15.0°	8128	8116	8084	8050	8035	8050	8084	8116
20.0°	7837	7818	7764	7707	7681	7707	7764	7818
25.0°	7460	7429	7349	7266	7230	7266	7349	7429
30.0°	7002	6956	6845	6733	6685	6733	6845	6956
35.0°	6463	6401	6257	6121	6064	6121	6257	6401
40.0°	5842	5769	5602	5445	5383	5445	5602	5769
45.0°	5154	5073	4889	4721	4657	4721	4889	5073
50.0°	4409	4332	4142	3975	3913	3975	4142	4332
55.0°	3638	3568	3395	3246	3188	3246	3395	3568
60.0°	2888	2825	2685	2559	2508	2559	2685	2825
65.0°	2208	2152	2039	1949	1907	1949	2039	2152
70.0°	1630	1585	1501	1444	1411	1444	1501	1585
75.0°	1156	1140	1100	1051	1006	1051	1100	1140
80.0°	595	733	689	596	504	596	689	733
85.0°	104	351	221	258	125	258	221	351
90.0°	9	35	16	23	12	23	16	35
95.0°	1	1	2	3	3	3	2	1
100.0°	1	1	1	1	1	1	1	1
105.0°	1	1	1	1	1	1	1	1
110.0°	2	2	2	2	2	2	2	2
115.0°	2	2	2	2	2	2	2	2
120.0°	2	2	2	2	2	2	2	2
125.0°	2	2	2	2	2	2	2	2
130.0°	3	3	3	3	3	3	3	3
135.0°	3	3	4	4	4	4	4	3
140.0°	4	4	4	4	4	4	4	4
145.0°	5	5	5	6	6	6	5	5
150.0°	6	6	6	7	7	7	6	6
155.0°	6	7	7	7	8	7	7	7
160.0°	7	7	7	8	8	8	7	7
165.0°	8	8	7	8	8	8	7	8
170.0°	8	8	7	7	7	7	7	8
175.0°	8	8	8	7	7	7	8	8
180.0°	8	8	7	7	7	7	7	8

Luminous Intensity (cd) Distribution Data (cont.)

γ \ C	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	8491	8491	8491	8491	8491	8491	8491	8491
5.0°	8451	8450	8446	8443	8441	8443	8446	8450
10.0°	8331	8326	8311	8297	8290	8297	8311	8326
15.0°	8128	8116	8084	8050	8035	8050	8084	8116
20.0°	7837	7818	7764	7707	7681	7707	7764	7818
25.0°	7460	7429	7349	7266	7230	7266	7349	7429
30.0°	7002	6956	6845	6733	6685	6733	6845	6956
35.0°	6463	6401	6257	6121	6064	6121	6257	6401
40.0°	5842	5769	5602	5445	5383	5445	5602	5769
45.0°	5154	5073	4889	4721	4657	4721	4889	5073
50.0°	4409	4332	4142	3975	3913	3975	4142	4332
55.0°	3638	3568	3395	3246	3188	3246	3395	3568
60.0°	2888	2825	2685	2559	2508	2559	2685	2825
65.0°	2208	2152	2039	1949	1907	1949	2039	2152
70.0°	1630	1585	1501	1444	1411	1444	1501	1585
75.0°	1156	1140	1100	1051	1006	1051	1100	1140
80.0°	595	733	689	596	504	596	689	733
85.0°	104	351	221	258	125	258	221	351
90.0°	9	35	16	23	12	23	16	35
95.0°	1	1	2	3	3	3	2	1
100.0°	1	1	1	1	1	1	1	1
105.0°	1	1	1	1	1	1	1	1
110.0°	2	2	2	2	2	2	2	2
115.0°	2	2	2	2	2	2	2	2
120.0°	2	2	2	2	2	2	2	2
125.0°	2	2	2	2	2	2	2	2
130.0°	3	3	3	3	3	3	3	3
135.0°	3	3	4	4	4	4	4	3
140.0°	4	4	4	4	4	4	4	4
145.0°	5	5	5	6	6	6	5	5
150.0°	6	6	6	7	7	7	6	6
155.0°	6	7	7	7	8	7	7	7
160.0°	7	7	7	8	8	8	7	7
165.0°	8	8	7	8	8	8	7	8
170.0°	8	8	7	7	7	7	7	8
175.0°	8	8	8	7	7	7	8	8
180.0°	8	8	7	7	7	7	7	8

Zonal Lumen Density Measurement

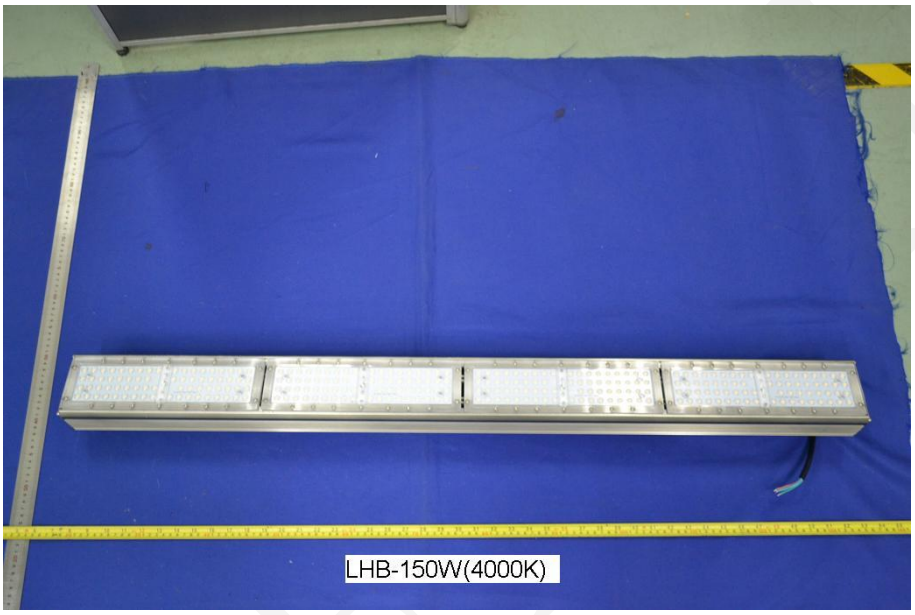
Deg	Flux (lm)	%
0-5	202.5	0.98
5-10	599.5	2.90
10-15	972.5	4.70
15-20	1305.9	6.31
20-25	1584.8	7.66
25-30	1796.1	8.68
30-35	1929.8	9.33
35-40	1979.8	9.57
40-45	1944.5	9.40
45-50	1827.3	8.83
50-55	1641.1	7.94
55-60	1406.2	6.79
60-65	1147.5	5.55
65-70	896.6	4.34
70-75	677.8	3.27
75-80	466.3	2.26
80-85	233.3	1.12
85-90	54.5	0.27
90-95	2.9	0.01
95-100	0.7	0.00
100-105	0.7	0.01
105-110	0.8	0.00
110-115	0.9	0.01
115-120	0.9	0.00
120-125	1.0	0.01
125-130	1.1	0.00
130-135	1.3	0.01
135-140	1.4	0.00
140-145	1.6	0.01
145-150	1.7	0.01
150-155	1.7	0.01
155-160	1.5	0.01
160-165	1.3	0.00
165-170	0.9	0.01
170-175	0.5	0.00
175-180	0.2	0.00

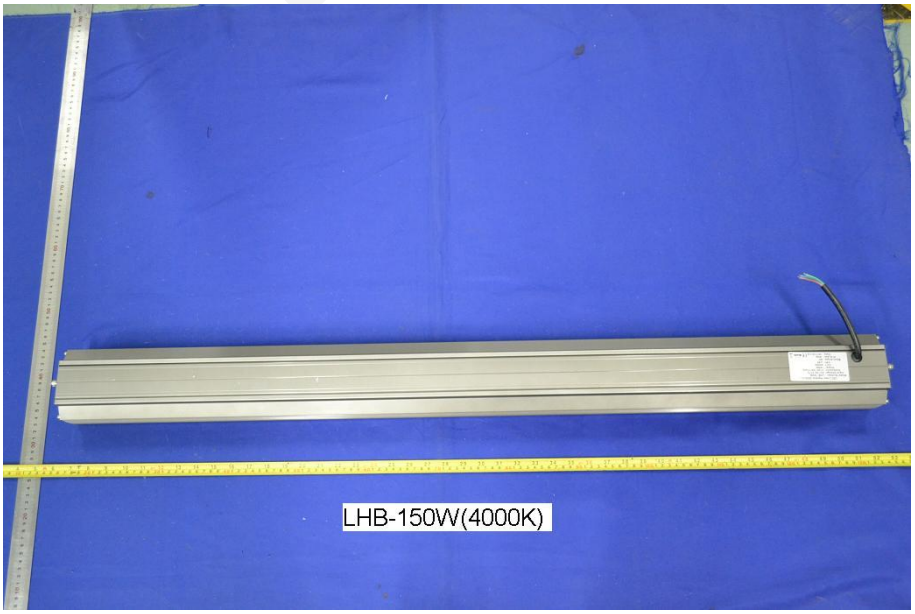
Deg	Flux (lm)	%
0-5	202.5	0.98
0-10	802.0	3.88
0-15	1774.4	8.58
0-20	3080.3	14.89
0-25	4665.1	22.55
0-30	6461.3	31.23
0-35	8391.1	40.56
0-40	10370.8	50.13
0-45	12315.3	59.53
0-50	14142.6	68.36
0-55	15783.7	76.30
0-60	17189.9	83.09
0-65	18337.4	88.64
0-70	19234.0	92.98
0-75	19911.8	96.25
0-80	20378.1	98.51
0-85	20611.4	99.63
0-90	20665.9	99.90
0-95	20668.8	99.91
0-100	20669.5	99.91
0-105	20670.3	99.92
0-110	20671.1	99.92
0-115	20671.9	99.93
0-120	20672.9	99.93
0-125	20673.9	99.94
0-130	20675.0	99.94
0-135	20676.3	99.95
0-140	20677.8	99.95
0-145	20679.4	99.96
0-150	20681.1	99.97
0-155	20682.7	99.98
0-160	20684.3	99.99
0-165	20685.5	99.99
0-170	20686.4	100.00
0-175	20687.0	100.00
0-180	20687.1	100.00

[Additional Test]

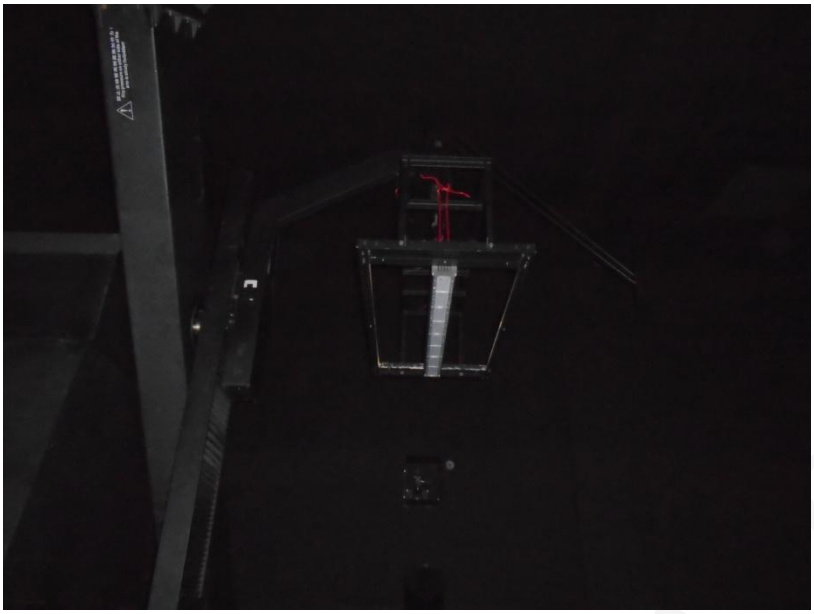
Test Item	Test Voltage (V)	Frequency (Hz)	Test Result
Power Factor:	277.0	60	0.9318
Total Harmonic Distortion:	277.0	60	12.01%
Total Harmonic Distortion:	120.0	60	7.04%
Total Harmonic Distortion:	100.0	60	7.30%
Power Factor:	100.0	60	0.9967

6. Product Photo





7. Product Test orientation in the Goniophotometer



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