



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

Shenzhen OKT Lighting Co.,LTD

NO.2076 Jincheng Rd, Shajing Town, Bao'an District, Shenzhen, China.

Test Model: TB4-DM-35U

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution, THD
Test Engineer:	Hexy He <i>Hexy He</i>
Report Number:	RSZ171106502-10
Test Date:	2017-11-06 to 2017-11-10
Report Date:	2017-11-16
Reviewed By:	Blake Zhang / EE Engineer <i>Blake Zhang</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxihu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588
Accreditation:	The IAS Accreditation Number TL-460.

Note: The test data was only valid for the test sample(s). 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. (Dongguan). 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.

1. Product Description

General Information:

One sample was received on 2017-11-06 and used for testing.

Model Tested:	TB4-DM-35U
Manufacturer:	Shenzhen OKT Lighting Co.,LTD
Brand Name:	OKT Lighting
Product Designation:	Direct Linear Ambient Luminaires
Burning Time Before Test:	0hour(For New Products)
Driver Model:	WP-DL60-40-A-0.50A

Rated Values:

Rated Voltage/Frequency:	100-277 V AC 60Hz
Rated Power:	20 W
Nominal CCT:	3500K
Nominal Lumen Output:	2600 lm
Length:	4ft

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
1.5m temperature integrating sphere	SENSING	SPR-600	S09008	25~50°C	2017-07-11	2018-07-11
High-precision rapid spectral analysis system	EVERFINE	HAAS-2000	M112048CA136 1125	380-780nm	2017-07-11	2018-07-11
Digital power meter	YOKOGAWA	WT310	13398	N/A	2016-12-05	2017-12-05
Programmable Precision DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2017-03-03	2018-03-03
thermometer	SENSING	NA	NA	25、50°C	2017-03-09	2018-03-09
Standard Light Source	SENSING	NA	LSD090808	N/A	2016-12-05	2017-12-05
Precision frequency power supply	ALL Power	APW-105N	970613	220V±10% 50Hz	2017-03-03	2018-03-03
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	0-150V, 0- 300V	2017-03-03	2018-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2017-03-03	2018-03-03
Digital power meter	YOKOGAWA	WT-210	91j926132	15/30/60/150/30 0/600 V	2017-03-03	2018-03-03

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N101 20001	1600mm,3000 W/10A	2017-03-09	2018-03-09
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C; -20°C~60°C	2017-03-20	2018-03-20
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=2.1% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=25K (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=0.17% of rdg, Power U=0.48%) (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=2.82% (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=0.46%) (K=2), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_i , 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**

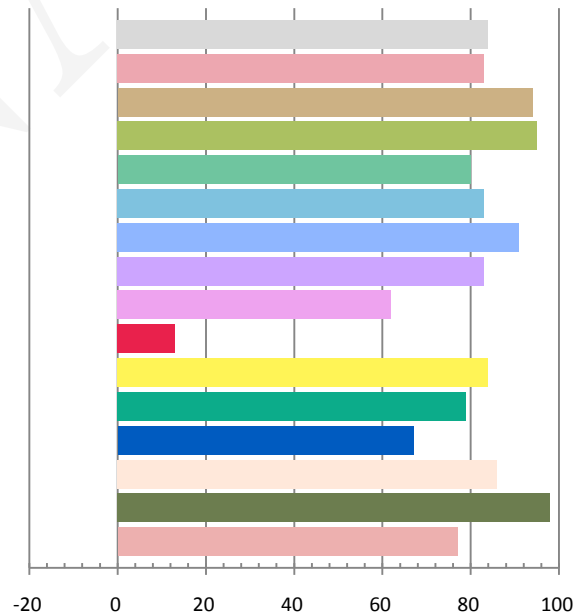
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1674	19.97	0.9939	2533.4	126.89

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
7.728	3394	-0.00162	0.4096	0.3891	0.2392	0.5112

Color Rendering Index

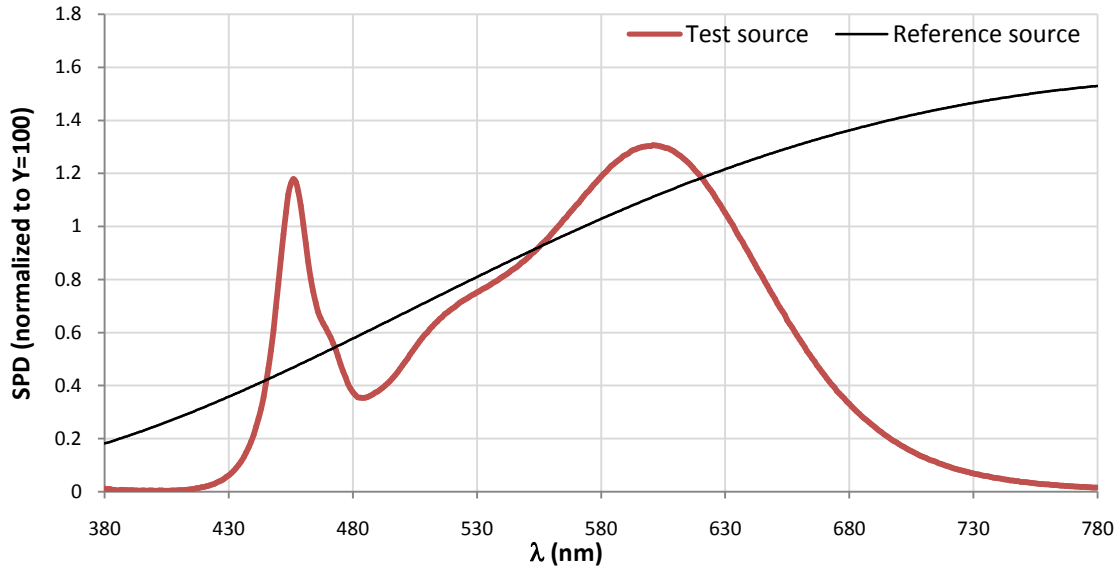
Ra			
83.9			
R1	R2	R3	R4
83	94	95	80
R5	R6	R7	R8
83	91	83	62
R9	R10	R11	R12
13	84	79	67
R13	R14	R15	
86	98	77	



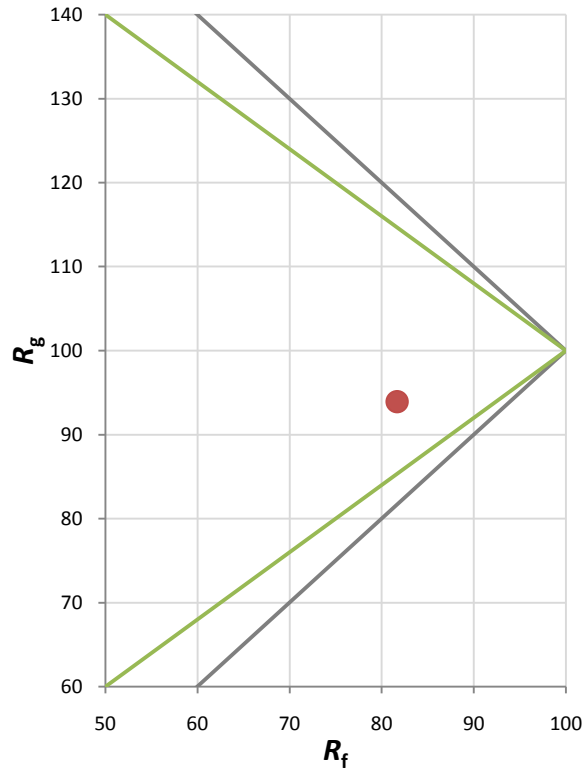
Fidelity Index and Gamut Index

Fidelity Index R_f	82
Gamut Index R_g	94

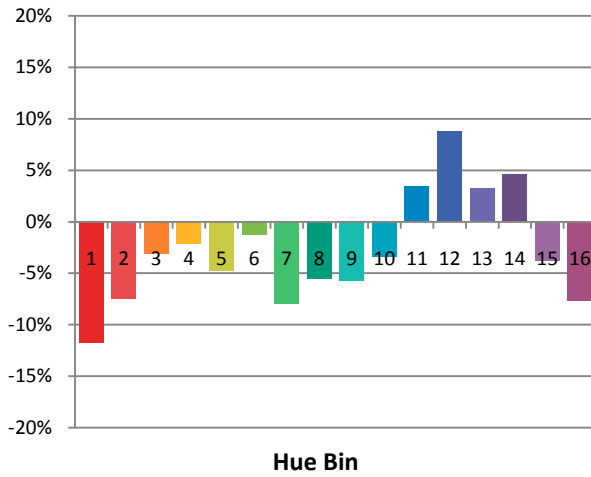
Spectral Power Distribution Comparison



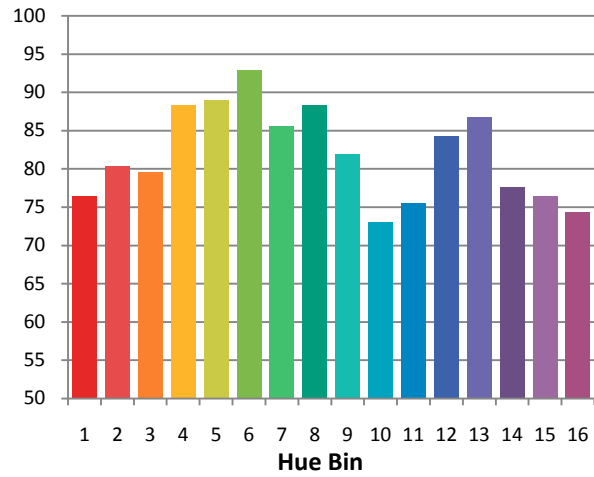
Plot of R_g versus R_f



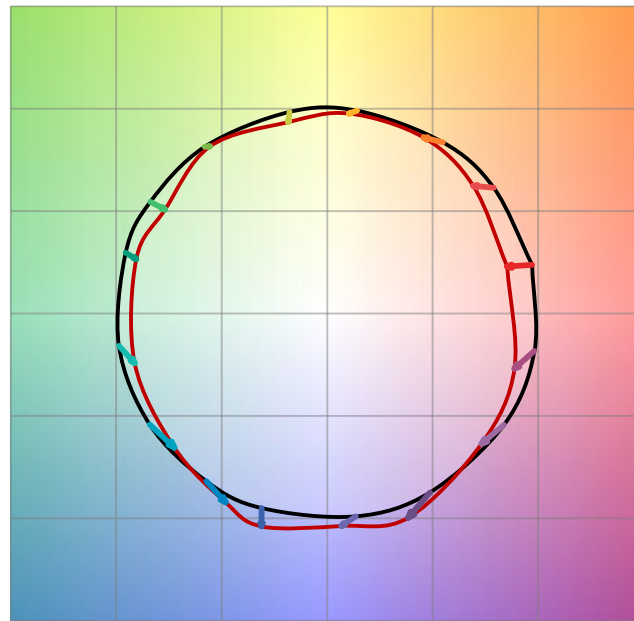
Chroma Shift by Hue



R_f by Hue

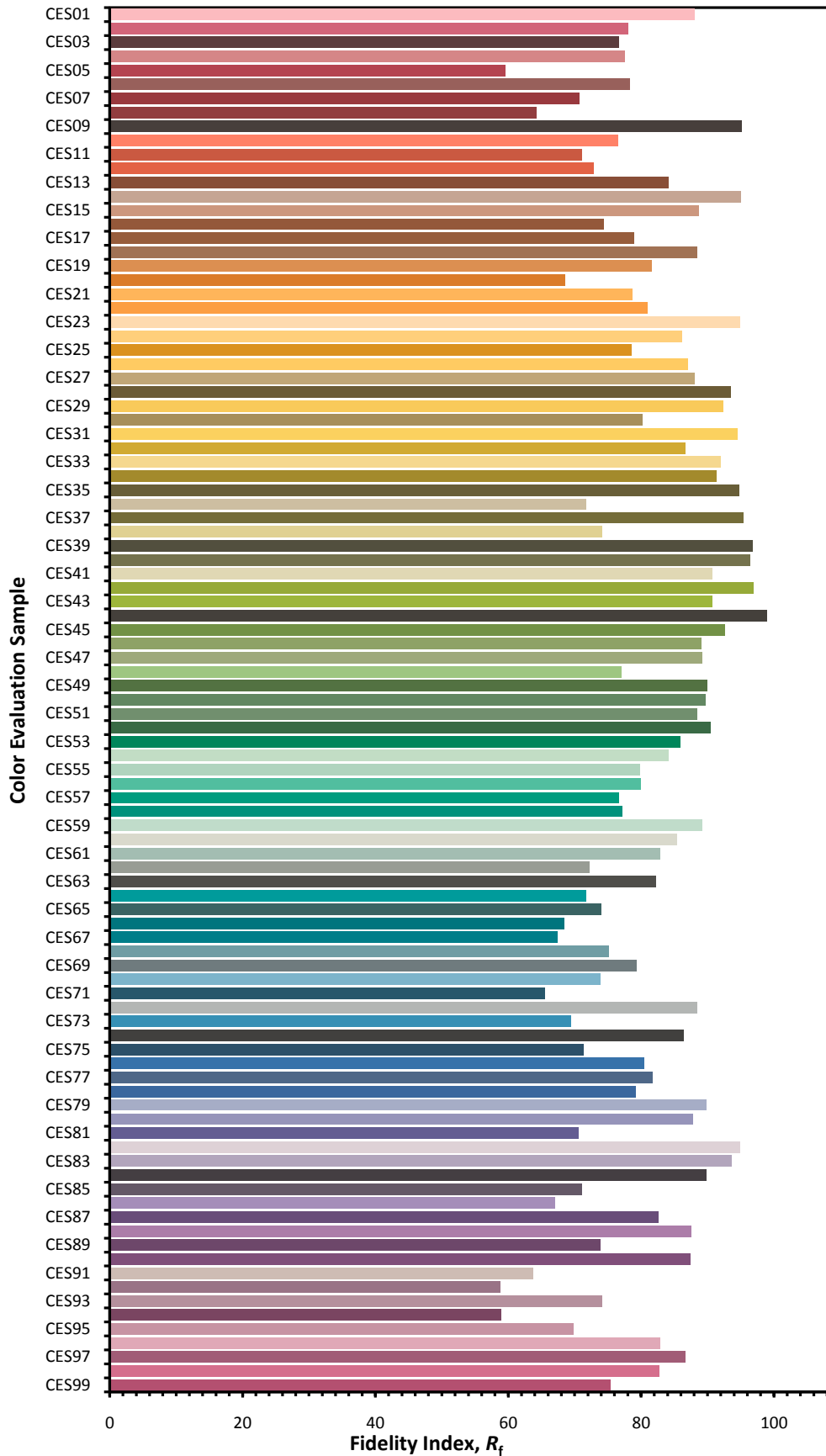


Color Vector Graphic

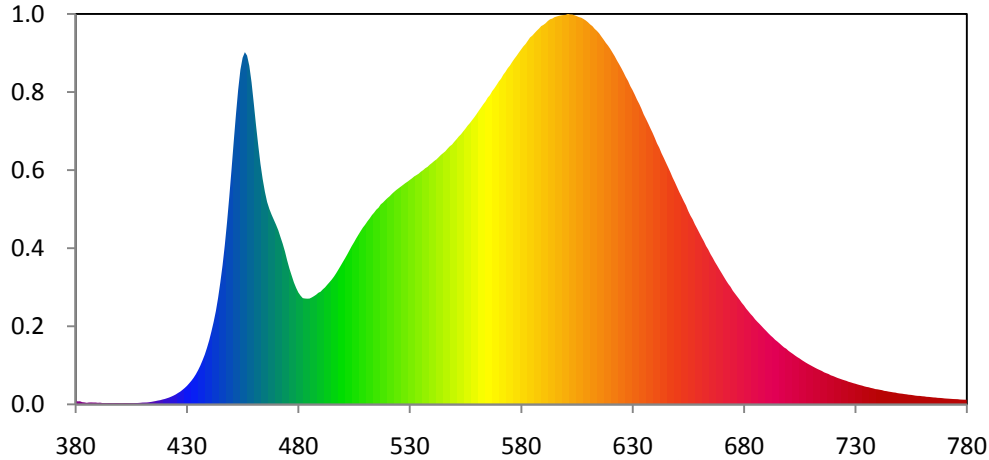


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



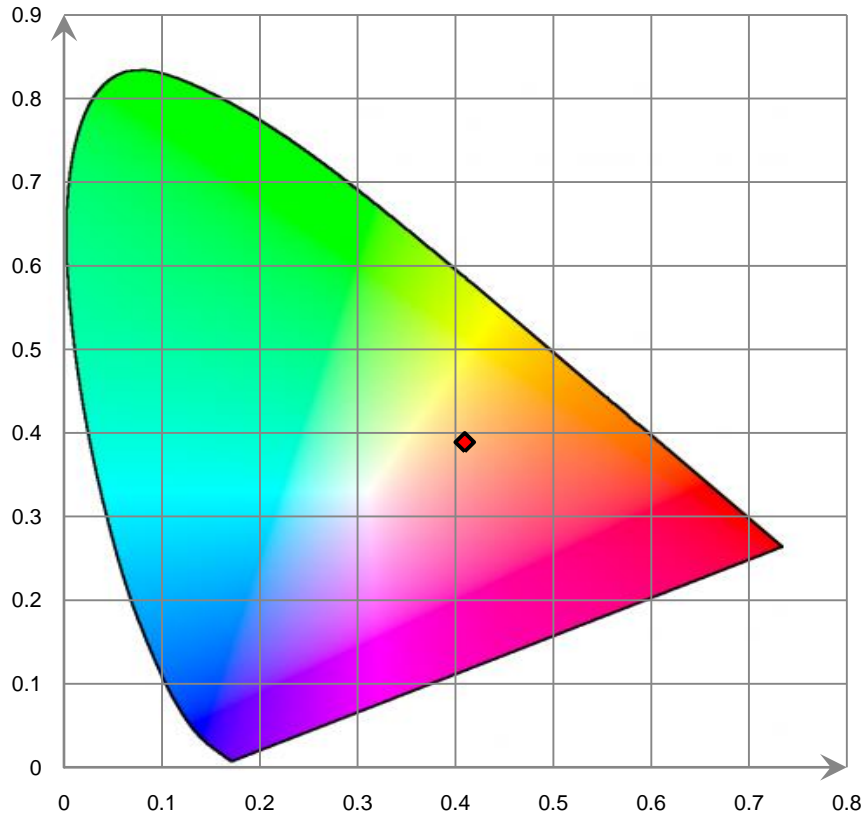
Relative Spectral Power Distribution



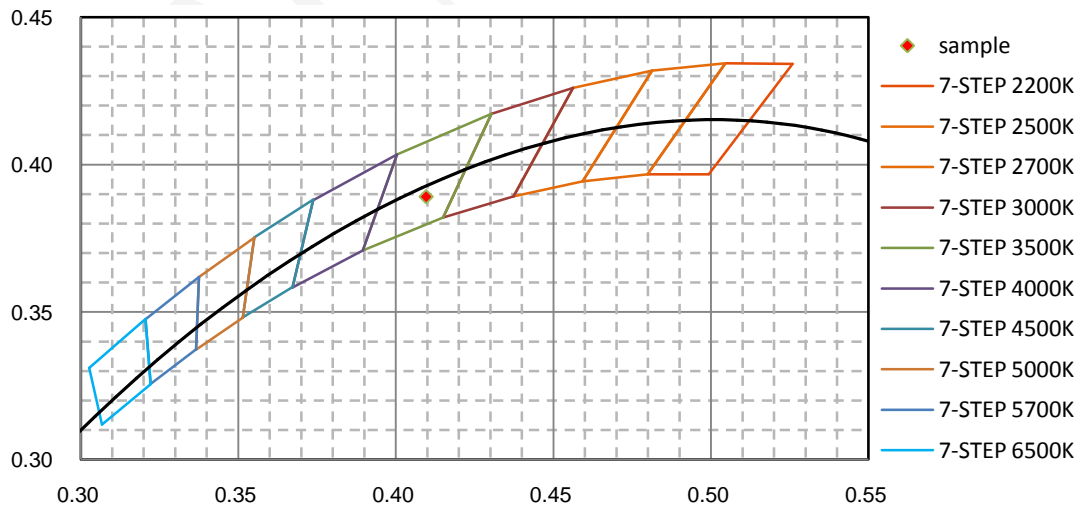
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	4.424E-01	421	7.543E-01	462	3.217E+01	503	1.915E+01	544	3.096E+01
381	3.746E-01	422	8.474E-01	463	2.985E+01	504	1.966E+01	545	3.119E+01
382	3.869E-01	423	9.622E-01	464	2.795E+01	505	2.012E+01	546	3.142E+01
383	2.746E-01	424	1.092E+00	465	2.638E+01	506	2.061E+01	547	3.174E+01
384	2.499E-01	425	1.234E+00	466	2.512E+01	507	2.107E+01	548	3.203E+01
385	1.956E-01	426	1.413E+00	467	2.425E+01	508	2.152E+01	549	3.225E+01
386	2.372E-01	427	1.579E+00	468	2.355E+01	509	2.195E+01	550	3.259E+01
387	2.462E-01	428	1.802E+00	469	2.292E+01	510	2.230E+01	551	3.290E+01
388	2.324E-01	429	2.037E+00	470	2.229E+01	511	2.272E+01	552	3.324E+01
389	2.345E-01	430	2.290E+00	471	2.161E+01	512	2.307E+01	553	3.352E+01
390	1.994E-01	431	2.601E+00	472	2.075E+01	513	2.348E+01	554	3.388E+01
391	2.200E-01	432	2.930E+00	473	1.992E+01	514	2.380E+01	555	3.422E+01
392	1.704E-01	433	3.302E+00	474	1.896E+01	515	2.416E+01	556	3.460E+01
393	1.568E-01	434	3.737E+00	475	1.786E+01	516	2.441E+01	557	3.491E+01
394	1.499E-01	435	4.240E+00	476	1.685E+01	517	2.483E+01	558	3.527E+01
395	1.697E-01	436	4.809E+00	477	1.600E+01	518	2.505E+01	559	3.563E+01
396	1.572E-01	437	5.464E+00	478	1.514E+01	519	2.533E+01	560	3.602E+01
397	1.451E-01	438	6.171E+00	479	1.447E+01	520	2.560E+01	561	3.643E+01
398	1.679E-01	439	7.010E+00	480	1.389E+01	521	2.583E+01	562	3.684E+01
399	1.656E-01	440	7.955E+00	481	1.350E+01	522	2.612E+01	563	3.723E+01
400	1.448E-01	441	9.054E+00	482	1.319E+01	523	2.638E+01	564	3.760E+01
401	1.317E-01	442	1.025E+01	483	1.314E+01	524	2.662E+01	565	3.807E+01
402	1.592E-01	443	1.160E+01	484	1.312E+01	525	2.682E+01	566	3.838E+01
403	1.602E-01	444	1.323E+01	485	1.313E+01	526	2.703E+01	567	3.887E+01
404	1.434E-01	445	1.517E+01	486	1.326E+01	527	2.724E+01	568	3.923E+01
405	1.508E-01	446	1.728E+01	487	1.343E+01	528	2.745E+01	569	3.964E+01
406	1.467E-01	447	1.976E+01	488	1.361E+01	529	2.763E+01	570	4.008E+01
407	1.651E-01	448	2.259E+01	489	1.385E+01	530	2.785E+01	571	4.042E+01
408	1.746E-01	449	2.574E+01	490	1.398E+01	531	2.805E+01	572	4.091E+01
409	1.930E-01	450	2.907E+01	491	1.428E+01	532	2.828E+01	573	4.128E+01
410	2.235E-01	451	3.261E+01	492	1.452E+01	533	2.845E+01	574	4.173E+01
411	2.310E-01	452	3.598E+01	493	1.485E+01	534	2.863E+01	575	4.206E+01
412	2.407E-01	453	3.905E+01	494	1.517E+01	535	2.887E+01	576	4.250E+01
413	2.719E-01	454	4.154E+01	495	1.549E+01	536	2.907E+01	577	4.290E+01
414	3.090E-01	455	4.303E+01	496	1.586E+01	537	2.931E+01	578	4.327E+01
415	3.647E-01	456	4.372E+01	497	1.628E+01	538	2.948E+01	579	4.366E+01
416	4.149E-01	457	4.328E+01	498	1.674E+01	539	2.975E+01	580	4.405E+01
417	4.736E-01	458	4.202E+01	499	1.720E+01	540	2.997E+01	581	4.442E+01
418	5.249E-01	459	3.999E+01	500	1.768E+01	541	3.020E+01	582	4.473E+01
419	6.024E-01	460	3.738E+01	501	1.814E+01	542	3.041E+01	583	4.513E+01
420	6.676E-01	461	3.468E+01	502	1.863E+01	543	3.068E+01	584	4.553E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.576E+01	626	4.119E+01	667	1.767E+01	708	5.147E+00	749	1.393E+00
586	4.607E+01	627	4.061E+01	668	1.722E+01	709	4.985E+00	750	1.354E+00
587	4.636E+01	628	4.013E+01	669	1.674E+01	710	4.835E+00	751	1.327E+00
588	4.663E+01	629	3.950E+01	670	1.629E+01	711	4.685E+00	752	1.280E+00
589	4.694E+01	630	3.901E+01	671	1.583E+01	712	4.538E+00	753	1.246E+00
590	4.710E+01	631	3.844E+01	672	1.537E+01	713	4.395E+00	754	1.195E+00
591	4.730E+01	632	3.783E+01	673	1.494E+01	714	4.271E+00	755	1.175E+00
592	4.758E+01	633	3.730E+01	674	1.458E+01	715	4.146E+00	756	1.135E+00
593	4.780E+01	634	3.669E+01	675	1.411E+01	716	3.981E+00	757	1.088E+00
594	4.788E+01	635	3.600E+01	676	1.375E+01	717	3.868E+00	758	1.057E+00
595	4.805E+01	636	3.545E+01	677	1.338E+01	718	3.763E+00	759	1.044E+00
596	4.814E+01	637	3.488E+01	678	1.301E+01	719	3.605E+00	760	1.008E+00
597	4.823E+01	638	3.428E+01	679	1.261E+01	720	3.516E+00	761	9.869E-01
598	4.829E+01	639	3.370E+01	680	1.228E+01	721	3.401E+00	762	9.408E-01
599	4.832E+01	640	3.306E+01	681	1.189E+01	722	3.281E+00	763	9.237E-01
600	4.834E+01	641	3.238E+01	682	1.155E+01	723	3.186E+00	764	8.980E-01
601	4.846E+01	642	3.185E+01	683	1.122E+01	724	3.089E+00	765	8.624E-01
602	4.840E+01	643	3.118E+01	684	1.092E+01	725	3.000E+00	766	8.468E-01
603	4.838E+01	644	3.060E+01	685	1.056E+01	726	2.918E+00	767	8.094E-01
604	4.828E+01	645	3.001E+01	686	1.026E+01	727	2.799E+00	768	7.993E-01
605	4.817E+01	646	2.941E+01	687	9.981E+00	728	2.726E+00	769	7.752E-01
606	4.806E+01	647	2.880E+01	688	9.690E+00	729	2.637E+00	770	7.416E-01
607	4.799E+01	648	2.815E+01	689	9.392E+00	730	2.565E+00	771	7.235E-01
608	4.783E+01	649	2.757E+01	690	9.114E+00	731	2.474E+00	772	7.047E-01
609	4.765E+01	650	2.696E+01	691	8.814E+00	732	2.400E+00	773	6.834E-01
610	4.743E+01	651	2.634E+01	692	8.544E+00	733	2.330E+00	774	6.661E-01
611	4.715E+01	652	2.579E+01	693	8.300E+00	734	2.238E+00	775	6.525E-01
612	4.694E+01	653	2.521E+01	694	8.021E+00	735	2.171E+00	776	6.427E-01
613	4.661E+01	654	2.469E+01	695	7.801E+00	736	2.125E+00	777	6.038E-01
614	4.636E+01	655	2.400E+01	696	7.564E+00	737	2.040E+00	778	5.897E-01
615	4.605E+01	656	2.343E+01	697	7.312E+00	738	1.982E+00	779	5.803E-01
616	4.566E+01	657	2.295E+01	698	7.068E+00	739	1.900E+00	780	5.814E-01
617	4.528E+01	658	2.234E+01	699	6.903E+00	740	1.865E+00		
618	4.487E+01	659	2.182E+01	700	6.648E+00	741	1.811E+00		
619	4.453E+01	660	2.128E+01	701	6.451E+00	742	1.763E+00		
620	4.412E+01	661	2.075E+01	702	6.254E+00	743	1.678E+00		
621	4.366E+01	662	2.024E+01	703	6.050E+00	744	1.641E+00		
622	4.321E+01	663	1.966E+01	704	5.857E+00	745	1.585E+00		
623	4.269E+01	664	1.921E+01	705	5.695E+00	746	1.543E+00		
624	4.222E+01	665	1.865E+01	706	5.496E+00	747	1.492E+00		
625	4.172E+01	666	1.819E+01	707	5.322E+00	748	1.464E+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: **Downward**

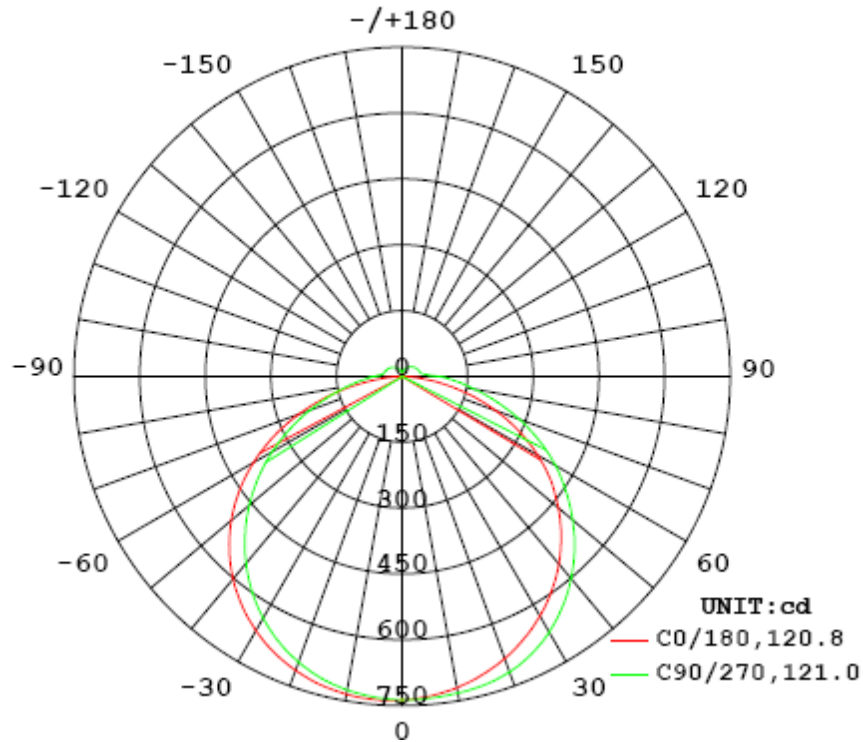
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1674	19.98	0.9943

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2540.65	127.16	738.9	1.27	1.35

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	120.8	122.2	121.0	122.8	121.7
Field Angle (10% I_{max}):	163.2	172.5	179.5	173.1	172.1

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	737	737	737	737	737	737	737	737
5.0°	739	738	737	735	733	732	731	731
10.0°	735	734	731	729	725	723	720	719
15.0°	726	724	722	717	712	708	705	704
20.0°	713	710	706	700	693	688	686	684
25.0°	694	691	685	676	667	663	661	659
30.0°	669	667	659	646	636	631	631	630
35.0°	638	636	626	610	599	595	596	596
40.0°	602	600	587	569	556	552	555	558
45.0°	559	558	542	522	508	505	510	514
50.0°	510	510	491	470	457	455	460	466
55.0°	455	454	435	414	401	399	406	413
60.0°	393	393	374	355	344	342	348	355
65.0°	325	325	308	292	284	282	286	292
70.0°	252	252	241	230	224	222	223	226
75.0°	176	179	176	172	170	167	163	160
80.0°	100	108	118	125	126	122	110	97
85.0°	35	54	75	85	88	84	72	49
90.0°	6	25	48	61	66	61	46	23
95.0°	5	20	36	46	50	45	33	17
100.0°	5	20	33	41	42	39	30	17
105.0°	5	19	32	40	41	38	29	16
110.0°	4	19	31	38	40	37	28	16
115.0°	4	18	30	37	38	35	27	15
120.0°	4	17	28	35	37	33	26	15
125.0°	4	15	27	33	35	32	25	14
130.0°	4	14	25	31	32	30	23	13
135.0°	5	14	23	28	30	27	22	12
140.0°	5	13	21	26	27	25	20	11
145.0°	5	11	19	24	25	23	18	11
150.0°	6	9	17	21	22	20	16	9
155.0°	6	8	15	18	19	18	14	8
160.0°	6	7	12	15	16	15	12	6
165.0°	5	6	9	12	13	12	8	6
170.0°	6	5	7	9	9	8	6	6
175.0°	6	5	5	6	6	5	6	6
180.0°	7	6	6	5	3	6	6	6

Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	737	737	737	737	737	737	737	737
5.0°	731	731	733	734	736	737	738	739
10.0°	720	721	724	729	732	735	735	735
15.0°	704	706	713	721	727	730	729	727
20.0°	684	688	699	709	717	721	720	715
25.0°	659	666	680	690	698	705	706	698
30.0°	630	639	654	664	672	681	685	677
35.0°	596	609	623	631	639	650	657	650
40.0°	557	573	586	592	601	613	623	618
45.0°	514	533	543	549	557	570	582	579
50.0°	466	487	496	501	510	522	535	534
55.0°	416	436	444	449	457	470	482	482
60.0°	357	381	391	396	404	416	426	425
65.0°	295	319	330	337	346	356	364	361
70.0°	228	253	267	276	285	293	297	289
75.0°	159	186	204	216	224	229	228	214
80.0°	91	119	143	159	169	170	161	139
85.0°	33	62	93	114	124	121	104	72
90.0°	4	27	56	75	84	79	62	31
95.0°	4	17	35	49	55	51	37	20
100.0°	4	17	31	39	44	41	34	20
105.0°	4	17	30	38	42	40	33	20
110.0°	4	17	30	37	41	39	32	19
115.0°	4	17	29	36	39	37	31	19
120.0°	4	17	28	35	38	36	29	18
125.0°	5	16	26	33	36	34	28	17
130.0°	5	15	25	31	34	32	26	15
135.0°	6	15	23	29	32	30	24	14
140.0°	6	14	22	27	29	28	23	14
145.0°	7	12	19	24	27	26	21	13
150.0°	7	10	17	22	24	23	20	13
155.0°	7	8	14	19	21	21	18	13
160.0°	6	7	9	15	18	18	16	13
165.0°	6	6	7	11	15	15	14	11
170.0°	6	6	7	7	11	12	11	10
175.0°	6	6	7	7	6	9	9	9
180.0°	7	7	7	6	5	4	6	6

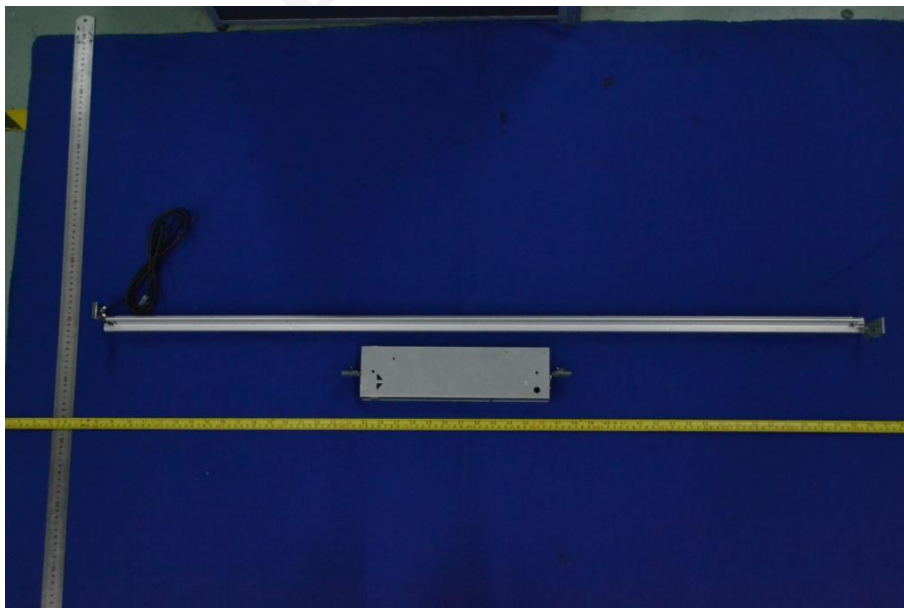
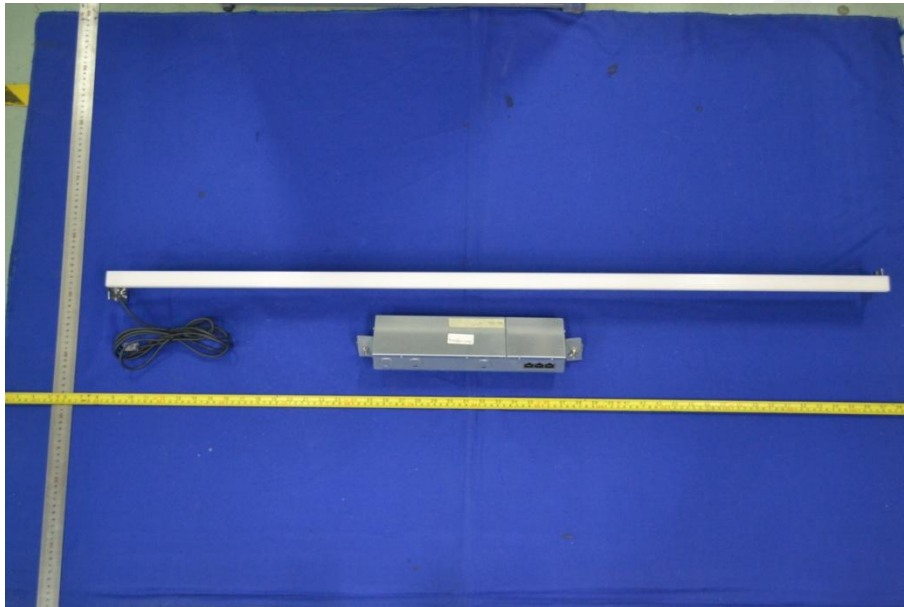
Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	17.6	0.69	0-5	17.6	0.69
5-10	52.3	2.06	0-10	69.9	2.75
10-15	85.7	3.38	0-15	155.7	6.13
15-20	117.0	4.60	0-20	272.6	10.73
20-25	145.1	5.71	0-25	417.7	16.44
25-30	169.0	6.66	0-30	586.8	23.10
30-35	188.0	7.39	0-35	774.8	30.49
35-40	201.2	7.92	0-40	976.0	38.41
40-45	208.2	8.20	0-45	1184.2	46.61
45-50	208.6	8.21	0-50	1392.8	54.82
50-55	202.3	7.96	0-55	1595.1	62.78
55-60	189.5	7.46	0-60	1784.5	70.24
60-65	170.2	6.70	0-65	1954.8	76.94
65-70	145.0	5.71	0-70	2099.7	82.65
70-75	115.6	4.55	0-75	2215.3	87.20
75-80	84.5	3.32	0-80	2299.8	90.52
80-85	55.8	2.20	0-85	2355.6	92.72
85-90	33.7	1.32	0-90	2389.3	94.04
90-95	21.1	0.83	0-95	2410.4	94.87
95-100	16.3	0.65	0-100	2426.7	95.52
100-105	15.1	0.59	0-105	2441.8	96.11
105-110	14.4	0.56	0-110	2456.1	96.67
110-115	13.4	0.53	0-115	2469.6	97.20
115-120	12.4	0.49	0-120	2481.9	97.69
120-125	11.2	0.44	0-125	2493.2	98.13
125-130	10.0	0.39	0-130	2503.2	98.52
130-135	8.7	0.35	0-135	2511.9	98.87
135-140	7.5	0.29	0-140	2519.4	99.16
140-145	6.2	0.25	0-145	2525.6	99.41
145-150	5.0	0.19	0-150	2530.5	99.60
150-155	3.8	0.15	0-155	2534.4	99.75
155-160	2.8	0.11	0-160	2537.1	99.86
160-165	1.8	0.07	0-165	2538.9	99.93
165-170	1.0	0.04	0-170	2540.0	99.97
170-175	0.5	0.02	0-175	2540.5	99.99
175-180	0.2	0.01	0-180	2540.7	100.00

[Additional Test]

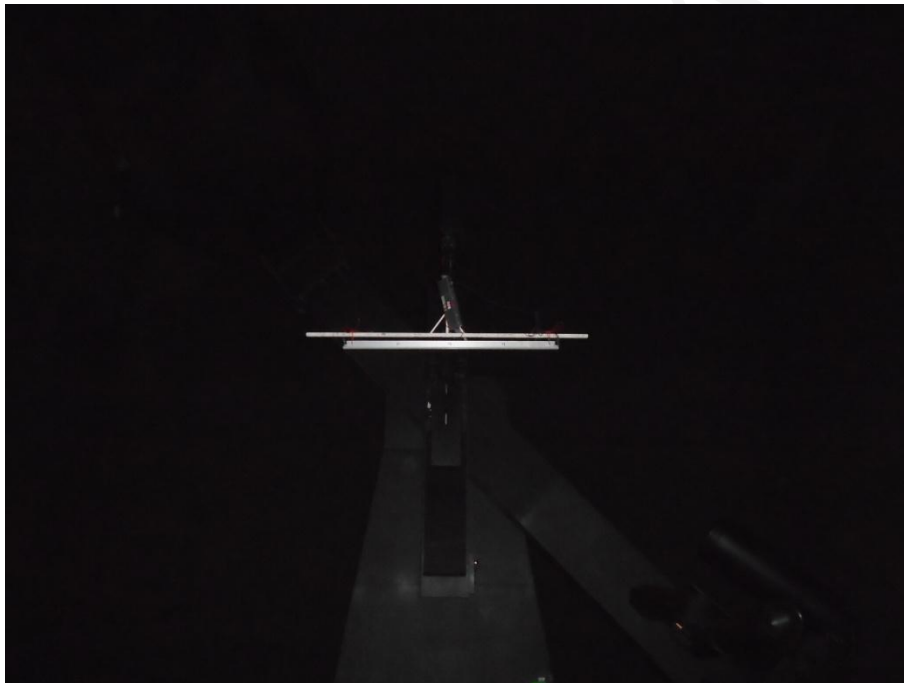
Test Item	Test Voltage (V)	Frequency (Hz)	Test Result
Power Factor:	100.0	60	0.9964
Total Harmonic Distortion:	100.0	60	6.26%
Total Harmonic Distortion:	120.0	60	7.90%
Total Harmonic Distortion:	277.0	60	8.61%
Power Factor:	277.0	60	0.949

6. Product Photo





7. Product Test orientation in the Goniophotometer



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