

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: TBHBR15-350W(5000K)

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:	RSZ170527503-10
Test Date:	2017-06-01
Report Date:	2017-06-19
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.

1. Product Description

General Information:

One sample was received on 2017-05-27 and used for testing.

Model Tested: TBHBR15-350W(5000K)
 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: 100-277V 50/60Hz
 Rated Power: 350 W
 Nominal CCT: 5000K
 Nominal Lumen Output: 45500 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
2.0m integrating sphere	EVERFINE	R98	11010018	R98	2016-11-18	2017-11-17
spectroradiometer	EVERFINE	HAAS-2000	20140912	380-780nm	2016-11-18	2017-11-17
Digital Power Meter	EVERFINE	PF2010A	1011004	600V/20A	2016-07-11	2017-07-10
Digital CC&CV DC Power Supply	EVERFINE	WY305-V1	1101047	30V/5A	2016-07-07	2017-07-06
Rapid recording photometer	EVERFINE	PHOTO-2000F	1007010	0.1lm—200klm	2016-12-30	2017-12-29
Standard Light Source	SENSING	N/A	LSD090808	N/A	2016-12-05	2017-12-04
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010-YF	1011001T	0-150V, 0-300V	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

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
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.

4 π 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**

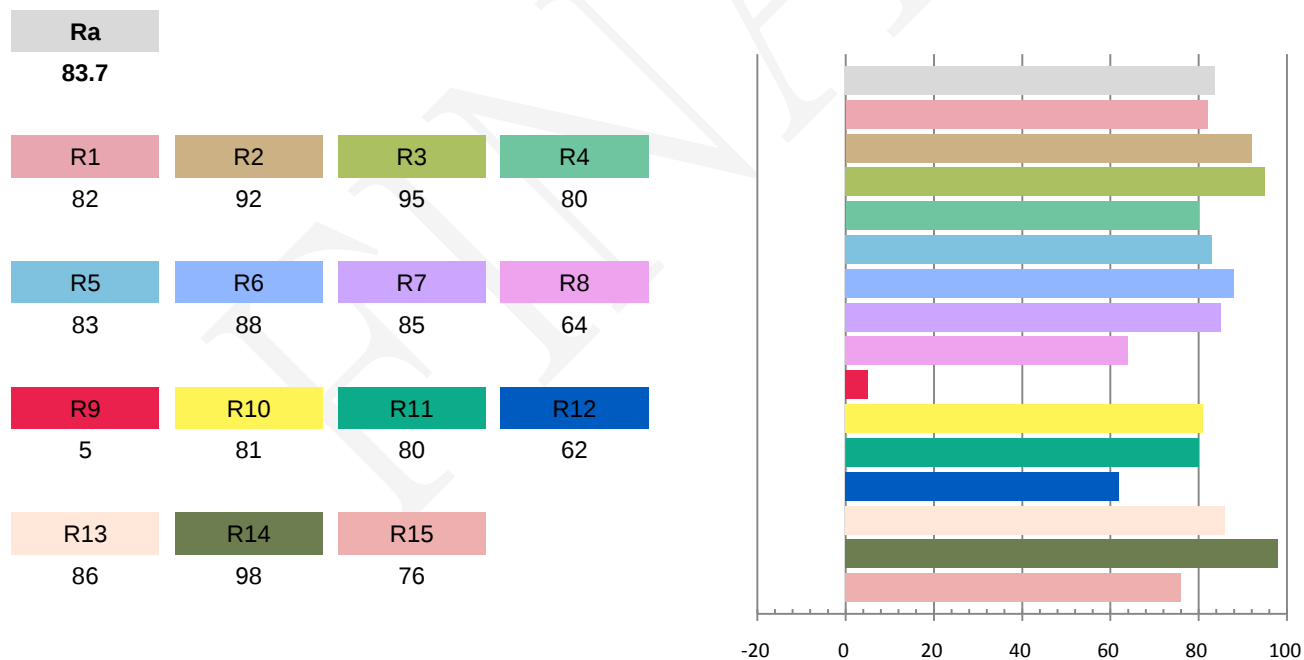
Test orientation: **Downward**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	2.817	337.2	0.9974	44289	131.35

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
138.42	5240	0.00279	0.3390	0.3522	0.2071	0.4840

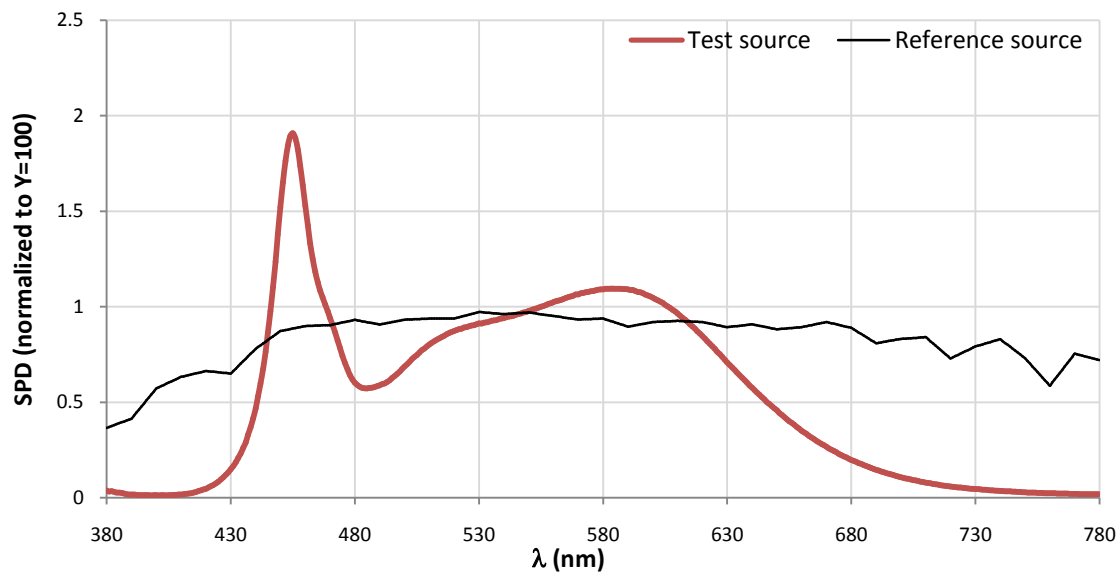
Color Rendering Index



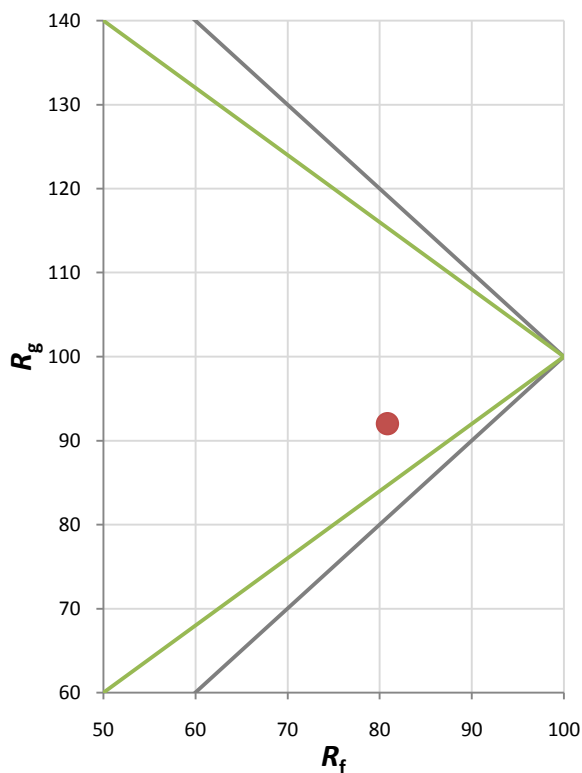
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	92

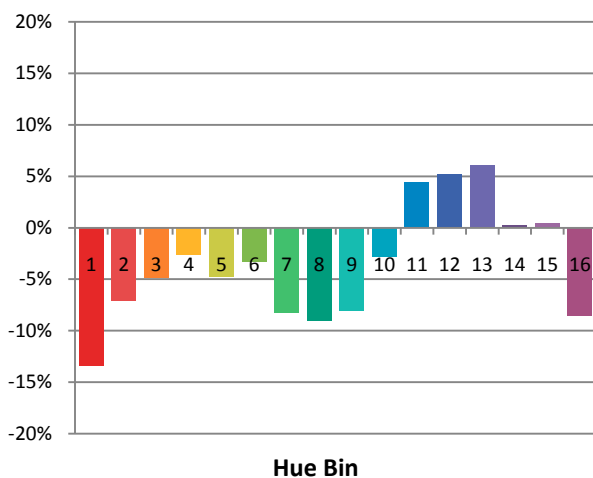
Spectral Power Distribution Comparison



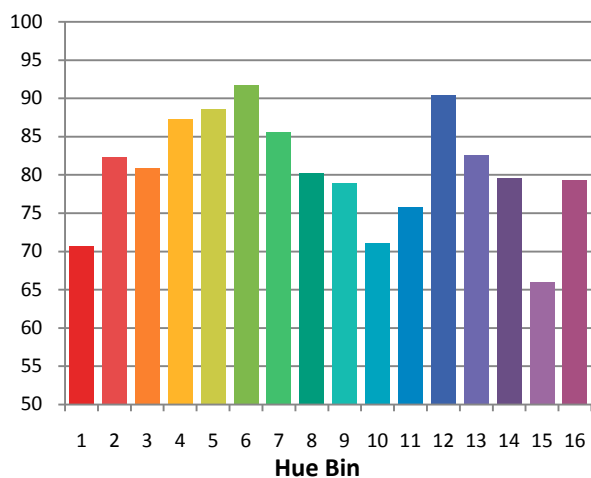
Plot of R_g versus R_f



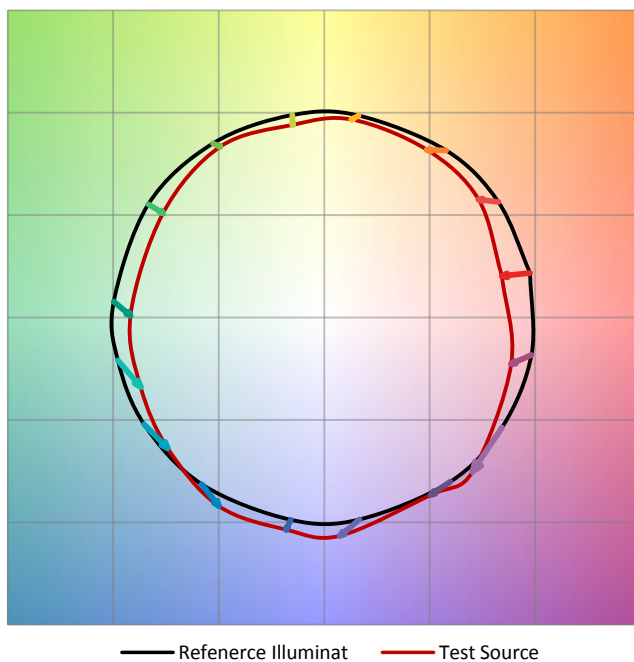
Chroma Shift by Hue



R_f by Hue

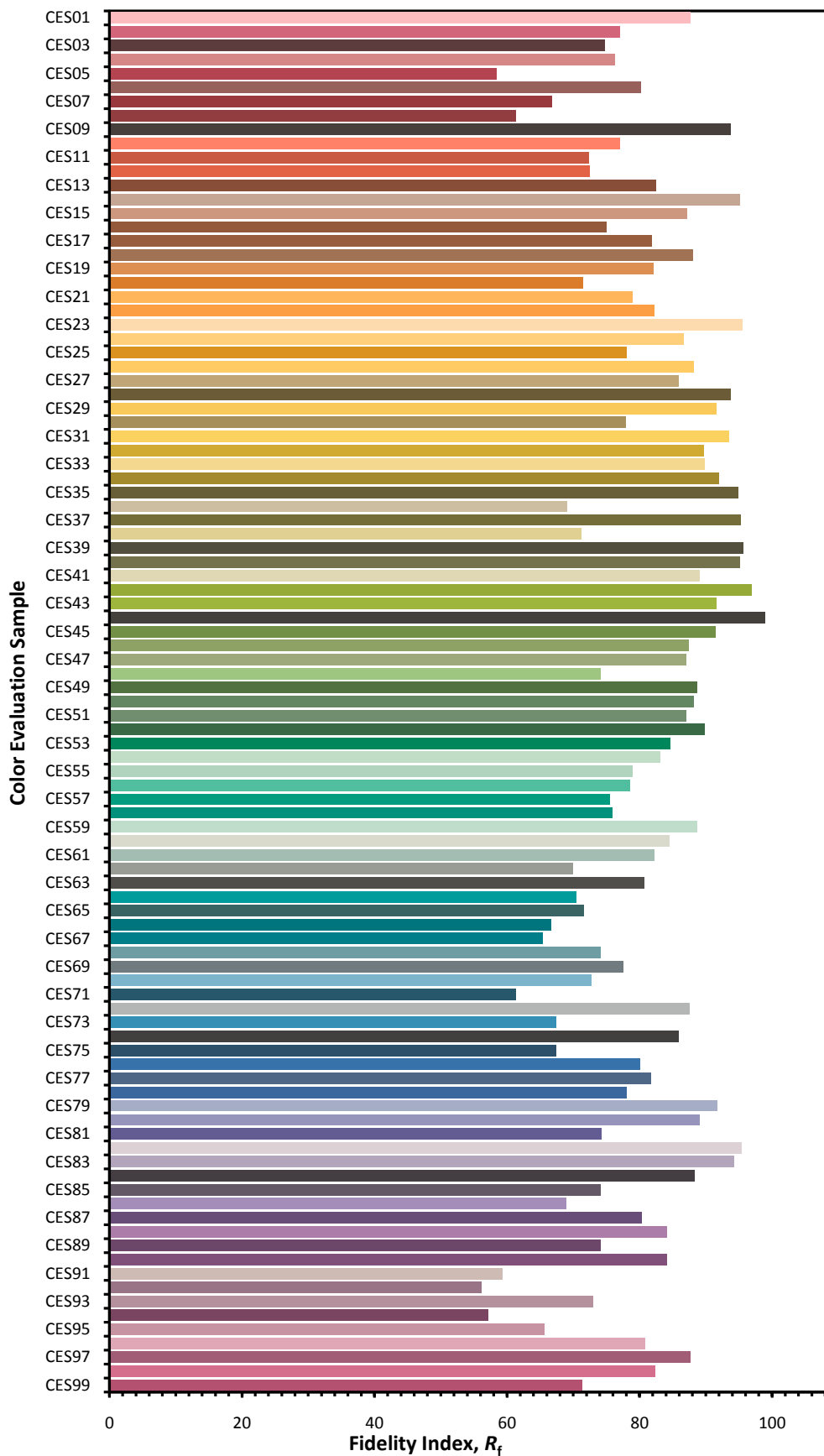


Color Vector Graphic

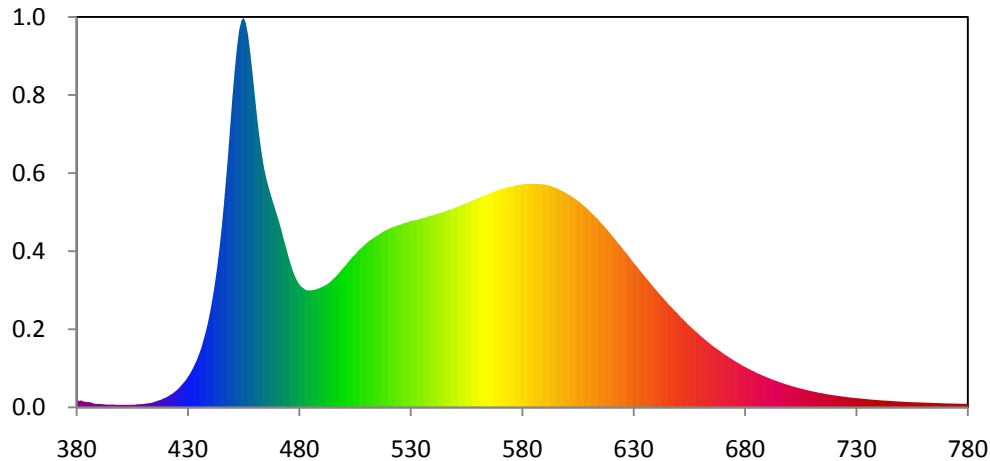


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



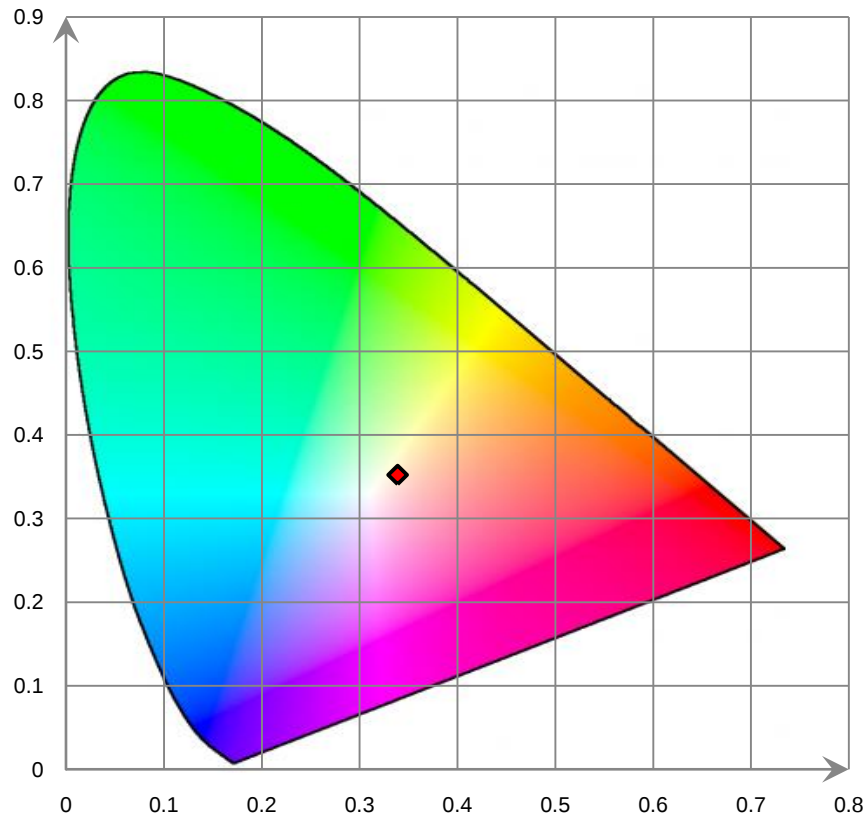
Relative Spectral Power Distribution



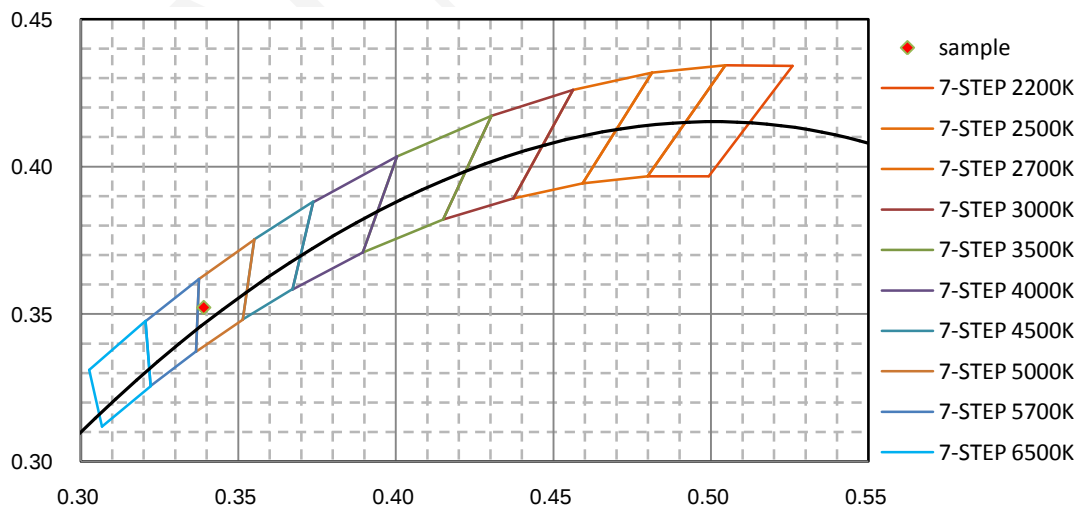
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.469E+01	421	3.452E+01	462	8.635E+02	503	4.703E+02	544	6.178E+02
381	2.050E+01	422	3.923E+01	463	8.109E+02	504	4.784E+02	545	6.211E+02
382	2.204E+01	423	4.337E+01	464	7.666E+02	505	4.848E+02	546	6.230E+02
383	1.929E+01	424	4.887E+01	465	7.314E+02	506	4.934E+02	547	6.258E+02
384	1.727E+01	425	5.463E+01	466	7.041E+02	507	5.006E+02	548	6.284E+02
385	1.731E+01	426	6.132E+01	467	6.798E+02	508	5.067E+02	549	6.304E+02
386	1.648E+01	427	6.936E+01	468	6.559E+02	509	5.136E+02	550	6.342E+02
387	1.446E+01	428	7.778E+01	469	6.330E+02	510	5.204E+02	551	6.362E+02
388	1.202E+01	429	8.597E+01	470	6.110E+02	511	5.262E+02	552	6.400E+02
389	1.080E+01	430	9.654E+01	471	5.865E+02	512	5.316E+02	553	6.424E+02
390	1.132E+01	431	1.074E+02	472	5.613E+02	513	5.361E+02	554	6.452E+02
391	1.083E+01	432	1.203E+02	473	5.336E+02	514	5.412E+02	555	6.485E+02
392	9.956E+00	433	1.350E+02	474	5.094E+02	515	5.451E+02	556	6.504E+02
393	9.115E+00	434	1.502E+02	475	4.816E+02	516	5.498E+02	557	6.537E+02
394	8.756E+00	435	1.689E+02	476	4.572E+02	517	5.548E+02	558	6.579E+02
395	8.698E+00	436	1.883E+02	477	4.355E+02	518	5.589E+02	559	6.601E+02
396	8.739E+00	437	2.135E+02	478	4.169E+02	519	5.623E+02	560	6.634E+02
397	8.634E+00	438	2.394E+02	479	4.018E+02	520	5.661E+02	561	6.669E+02
398	7.765E+00	439	2.693E+02	480	3.901E+02	521	5.690E+02	562	6.689E+02
399	8.212E+00	440	3.032E+02	481	3.823E+02	522	5.719E+02	563	6.717E+02
400	8.351E+00	441	3.434E+02	482	3.772E+02	523	5.736E+02	564	6.749E+02
401	7.988E+00	442	3.874E+02	483	3.724E+02	524	5.779E+02	565	6.781E+02
402	8.167E+00	443	4.371E+02	484	3.713E+02	525	5.787E+02	566	6.813E+02
403	8.279E+00	444	4.948E+02	485	3.710E+02	526	5.818E+02	567	6.832E+02
404	7.912E+00	445	5.606E+02	486	3.725E+02	527	5.848E+02	568	6.857E+02
405	8.579E+00	446	6.331E+02	487	3.736E+02	528	5.857E+02	569	6.903E+02
406	8.264E+00	447	7.147E+02	488	3.755E+02	529	5.888E+02	570	6.899E+02
407	9.538E+00	448	8.003E+02	489	3.786E+02	530	5.915E+02	571	6.940E+02
408	1.001E+01	449	8.939E+02	490	3.815E+02	531	5.914E+02	572	6.954E+02
409	1.027E+01	450	9.865E+02	491	3.852E+02	532	5.945E+02	573	6.978E+02
410	1.055E+01	451	1.070E+03	492	3.882E+02	533	5.956E+02	574	6.987E+02
411	1.201E+01	452	1.143E+03	493	3.933E+02	534	5.977E+02	575	7.010E+02
412	1.267E+01	453	1.197E+03	494	3.990E+02	535	6.003E+02	576	7.012E+02
413	1.393E+01	454	1.228E+03	495	4.064E+02	536	6.020E+02	577	7.040E+02
414	1.530E+01	455	1.237E+03	496	4.124E+02	537	6.026E+02	578	7.059E+02
415	1.743E+01	456	1.220E+03	497	4.201E+02	538	6.063E+02	579	7.068E+02
416	1.986E+01	457	1.181E+03	498	4.282E+02	539	6.079E+02	580	7.074E+02
417	2.229E+01	458	1.126E+03	499	4.366E+02	540	6.096E+02	581	7.090E+02
418	2.458E+01	459	1.061E+03	500	4.448E+02	541	6.122E+02	582	7.095E+02
419	2.788E+01	460	9.912E+02	501	4.528E+02	542	6.148E+02	583	7.098E+02
420	3.084E+01	461	9.248E+02	502	4.614E+02	543	6.163E+02	584	7.098E+02

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	7.094E+02	626	4.957E+02	667	1.877E+02	708	5.449E+01	749	1.875E+01
586	7.090E+02	627	4.873E+02	668	1.824E+02	709	5.269E+01	750	1.833E+01
587	7.090E+02	628	4.783E+02	669	1.780E+02	710	5.122E+01	751	1.779E+01
588	7.083E+02	629	4.686E+02	670	1.723E+02	711	4.979E+01	752	1.748E+01
589	7.082E+02	630	4.593E+02	671	1.672E+02	712	4.833E+01	753	1.703E+01
590	7.076E+02	631	4.510E+02	672	1.631E+02	713	4.665E+01	754	1.679E+01
591	7.055E+02	632	4.425E+02	673	1.582E+02	714	4.540E+01	755	1.660E+01
592	7.048E+02	633	4.336E+02	674	1.538E+02	715	4.431E+01	756	1.608E+01
593	7.022E+02	634	4.246E+02	675	1.491E+02	716	4.271E+01	757	1.597E+01
594	6.987E+02	635	4.162E+02	676	1.449E+02	717	4.154E+01	758	1.564E+01
595	6.972E+02	636	4.076E+02	677	1.405E+02	718	4.033E+01	759	1.561E+01
596	6.936E+02	637	3.990E+02	678	1.367E+02	719	3.914E+01	760	1.532E+01
597	6.898E+02	638	3.905E+02	679	1.320E+02	720	3.847E+01	761	1.493E+01
598	6.867E+02	639	3.817E+02	680	1.286E+02	721	3.719E+01	762	1.474E+01
599	6.833E+02	640	3.735E+02	681	1.249E+02	722	3.615E+01	763	1.449E+01
600	6.786E+02	641	3.652E+02	682	1.212E+02	723	3.519E+01	764	1.416E+01
601	6.743E+02	642	3.568E+02	683	1.174E+02	724	3.447E+01	765	1.392E+01
602	6.705E+02	643	3.493E+02	684	1.146E+02	725	3.349E+01	766	1.365E+01
603	6.659E+02	644	3.408E+02	685	1.103E+02	726	3.239E+01	767	1.360E+01
604	6.611E+02	645	3.332E+02	686	1.071E+02	727	3.152E+01	768	1.334E+01
605	6.551E+02	646	3.243E+02	687	1.043E+02	728	3.083E+01	769	1.289E+01
606	6.499E+02	647	3.183E+02	688	1.008E+02	729	2.997E+01	770	1.281E+01
607	6.439E+02	648	3.103E+02	689	9.793E+01	730	2.934E+01	771	1.256E+01
608	6.380E+02	649	3.033E+02	690	9.478E+01	731	2.874E+01	772	1.230E+01
609	6.320E+02	650	2.960E+02	691	9.198E+01	732	2.817E+01	773	1.219E+01
610	6.253E+02	651	2.876E+02	692	8.912E+01	733	2.708E+01	774	1.197E+01
611	6.176E+02	652	2.810E+02	693	8.660E+01	734	2.657E+01	775	1.194E+01
612	6.108E+02	653	2.739E+02	694	8.394E+01	735	2.585E+01	776	1.182E+01
613	6.037E+02	654	2.664E+02	695	8.161E+01	736	2.515E+01	777	1.155E+01
614	5.970E+02	655	2.596E+02	696	7.891E+01	737	2.453E+01	778	1.143E+01
615	5.888E+02	656	2.536E+02	697	7.666E+01	738	2.413E+01	779	1.145E+01
616	5.810E+02	657	2.471E+02	698	7.403E+01	739	2.354E+01	780	1.147E+01
617	5.734E+02	658	2.403E+02	699	7.205E+01	740	2.285E+01		
618	5.651E+02	659	2.343E+02	700	6.965E+01	741	2.245E+01		
619	5.569E+02	660	2.275E+02	701	6.768E+01	742	2.177E+01		
620	5.483E+02	661	2.216E+02	702	6.561E+01	743	2.134E+01		
621	5.396E+02	662	2.157E+02	703	6.355E+01	744	2.130E+01		
622	5.311E+02	663	2.100E+02	704	6.159E+01	745	2.047E+01		
623	5.221E+02	664	2.041E+02	705	5.990E+01	746	2.006E+01		
624	5.136E+02	665	1.982E+02	706	5.812E+01	747	1.968E+01		
625	5.047E+02	666	1.926E+02	707	5.610E+01	748	1.912E+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**

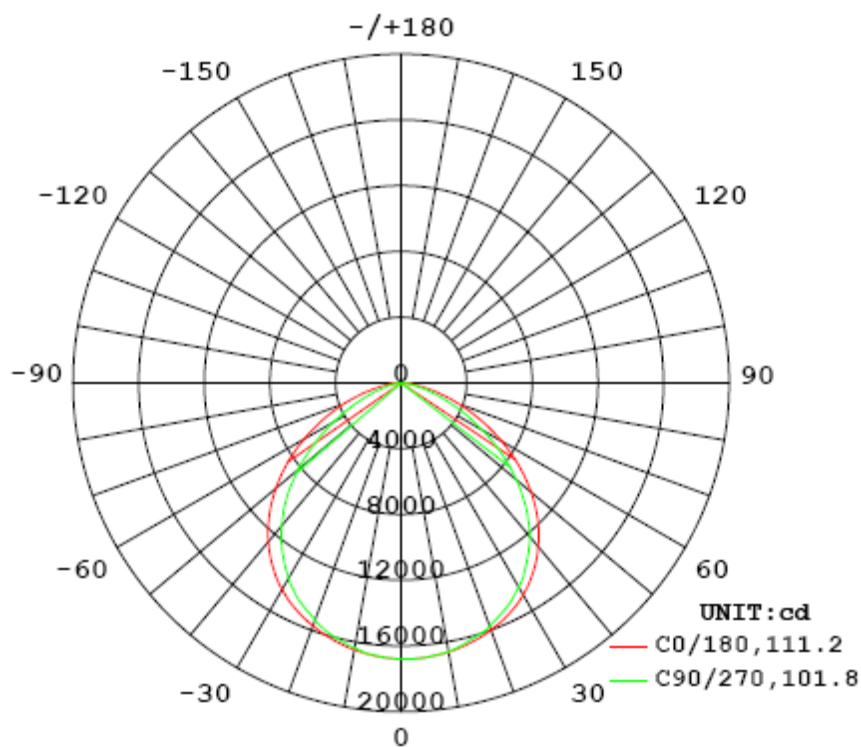
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	2.8050	336	0.9985

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
44294.1	131.83	16800.0	1.31	1.27

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	111.2	109.3	101.8	109.4	107.9
Field Angle (10% I _{max}):	155.5	152.4	145.5	152.3	151.4

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	16792	16792	16792	16792	16792	16792	16792	16792
5.0°	16693	16696	16699	16692	16668	16678	16704	16748
10.0°	16481	16498	16473	16405	16356	16383	16497	16594
15.0°	16156	16149	16066	15997	15965	15961	16101	16308
20.0°	15731	15690	15552	15464	15366	15419	15609	15907
25.0°	15201	15097	14920	14713	14661	14668	15002	15353
30.0°	14531	14405	14076	13860	13736	13821	14193	14709
35.0°	13653	13483	13177	12810	12626	12772	13334	13797
40.0°	12609	12420	12054	11590	11345	11552	12233	12744
45.0°	11381	11196	10797	10177	9879	10132	10984	11490
50.0°	9987	9827	9396	8608	8205	8549	9569	10080
55.0°	8453	8395	7891	6925	6451	6866	8024	8586
60.0°	6849	6877	6251	5227	4763	5161	6326	6997
65.0°	5248	5333	4630	3632	3243	3569	4645	5366
70.0°	3720	3813	3086	2281	1982	2228	3048	3769
75.0°	2358	2372	1761	1213	1004	1173	1696	2280
80.0°	1202	1135	726	434	319	405	661	1026
85.0°	344	242	85	61	51	54	69	164
90.0°	2	13	2	2	2	2	3	2
95.0°	3	3	3	3	3	3	3	3
100.0°	3	4	4	3	3	4	4	4
105.0°	4	4	4	4	4	4	4	4
110.0°	4	4	5	5	5	5	5	4
115.0°	4	4	5	5	5	5	5	4
120.0°	5	5	5	5	5	5	5	5
125.0°	5	6	6	6	6	6	6	6
130.0°	6	7	7	7	7	7	7	7
135.0°	8	8	8	9	9	9	8	8
140.0°	9	10	11	11	11	11	11	10
145.0°	12	13	14	15	15	15	14	12
150.0°	14	15	17	18	18	18	17	15
155.0°	16	17	19	20	20	20	19	17
160.0°	18	18	20	21	21	21	21	18
165.0°	19	19	20	21	21	21	20	18
170.0°	18	18	18	18	18	18	18	18
175.0°	18	17	18	17	17	18	18	18
180.0°	16	15	15	14	16	15	16	16

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	16792	16792	16792	16792	16792	16792	16792	16792
5.0°	16765	16749	16755	16755	16771	16771	16751	16705
10.0°	16618	16604	16536	16572	16607	16603	16541	16508
15.0°	16362	16315	16252	16177	16184	16219	16256	16166
20.0°	16003	15924	15738	15748	15752	15801	15723	15730
25.0°	15523	15461	15237	15070	15122	15123	15203	15220
30.0°	14884	14836	14491	14304	14330	14370	14433	14552
35.0°	14038	13966	13711	13393	13335	13457	13603	13654
40.0°	12998	13011	12748	12262	12194	12324	12600	12678
45.0°	11782	11784	11583	10919	10784	10993	11410	11494
50.0°	10346	10431	10264	9411	9187	9477	10090	10162
55.0°	8758	8926	8716	7775	7446	7841	8570	8721
60.0°	7067	7356	7038	6013	5690	6103	6961	7224
65.0°	5361	5732	5340	4350	4056	4428	5310	5671
70.0°	3759	4103	3663	2859	2625	2927	3692	4124
75.0°	2343	2581	2189	1653	1500	1700	2239	2656
80.0°	1177	1292	1030	733	649	769	1101	1391
85.0°	287	327	243	161	145	163	284	410
90.0°	1	1	1	13	13	14	16	19
95.0°	2	2	2	2	1	1	1	1
100.0°	2	2	2	2	2	2	2	2
105.0°	3	3	3	2	2	2	2	2
110.0°	3	3	3	3	3	3	3	3
115.0°	4	4	4	4	3	3	3	3
120.0°	4	4	4	4	4	4	4	4
125.0°	5	5	5	5	5	4	4	5
130.0°	6	6	6	6	5	5	5	5
135.0°	7	7	7	7	7	6	6	7
140.0°	8	8	8	8	8	8	8	8
145.0°	9	9	9	10	10	10	9	9
150.0°	10	9	10	11	11	11	10	10
155.0°	11	10	11	12	13	12	12	12
160.0°	13	12	12	13	13	13	13	13
165.0°	13	13	12	13	13	13	13	13
170.0°	14	14	13	13	12	12	13	14
175.0°	15	15	14	14	13	12	14	15
180.0°	16	16	16	15	15	15	15	16

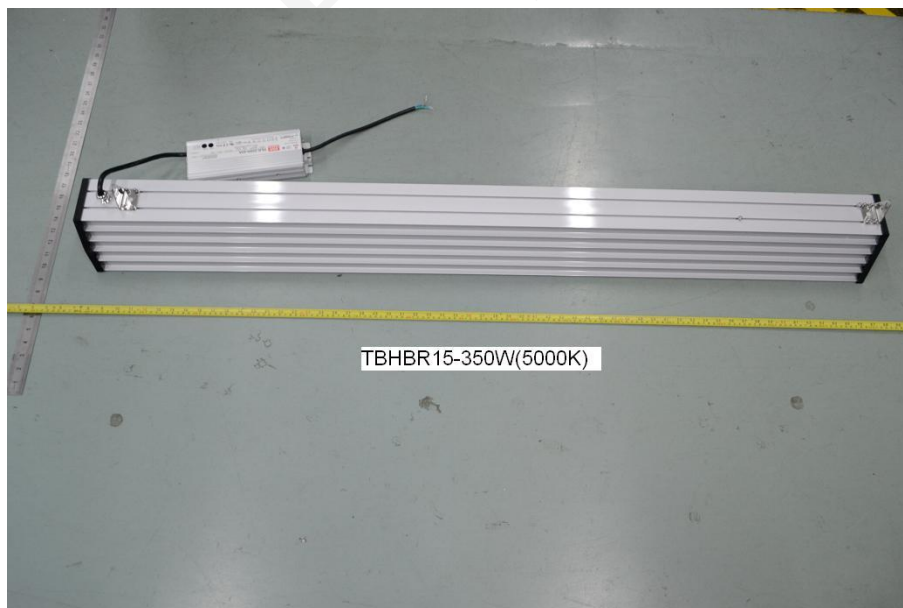
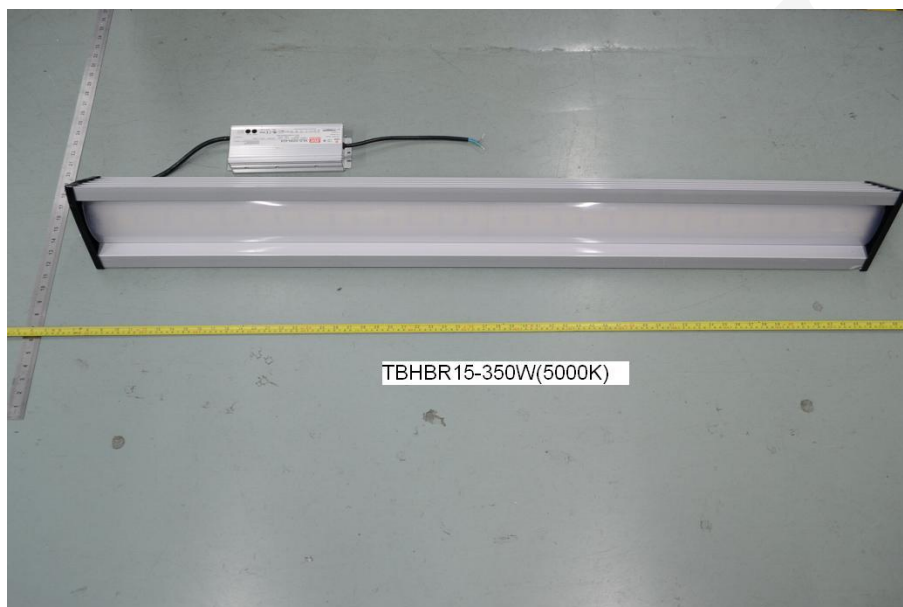
Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	400.7	0.90	0-5	400.7	0.90
5-10	1189.1	2.69	0-10	1589.8	3.59
10-15	1939.0	4.38	0-15	3528.8	7.97
15-20	2626.0	5.93	0-20	6154.7	13.90
20-25	3228.5	7.28	0-25	9383.3	21.18
25-30	3728.7	8.42	0-30	13111.9	29.60
30-35	4090.9	9.24	0-35	17202.8	38.84
35-40	4297.8	9.70	0-40	21500.6	48.54
40-45	4333.3	9.78	0-45	25833.8	58.32
45-50	4173.7	9.43	0-50	30007.6	67.75
50-55	3831.0	8.65	0-55	33838.5	76.40
55-60	3325.3	7.50	0-60	37163.8	83.90
60-65	2697.9	6.09	0-65	39861.7	89.99
65-70	2011.5	4.54	0-70	41873.2	94.53
70-75	1335.5	3.02	0-75	43208.7	97.55
75-80	736.1	1.66	0-80	43944.8	99.21
80-85	268.6	0.61	0-85	44213.4	99.82
85-90	39.7	0.09	0-90	44253.1	99.91
90-95	1.3	0.00	0-95	44254.5	99.91
95-100	1.3	0.00	0-100	44255.8	99.91
100-105	1.6	0.01	0-105	44257.4	99.92
105-110	1.8	0.00	0-110	44259.2	99.92
110-115	1.9	0.01	0-115	44261.2	99.93
115-120	2.1	0.00	0-120	44263.3	99.93
120-125	2.3	0.01	0-125	44265.5	99.94
125-130	2.5	0.00	0-130	44268.0	99.94
130-135	2.8	0.01	0-135	44270.8	99.95
135-140	3.1	0.00	0-140	44273.9	99.95
140-145	3.5	0.01	0-145	44277.4	99.96
145-150	3.7	0.01	0-150	44281.1	99.97
150-155	3.6	0.01	0-155	44284.7	99.98
155-160	3.3	0.01	0-160	44288.0	99.99
160-165	2.7	0.00	0-165	44290.7	99.99
165-170	1.9	0.01	0-170	44292.6	100.00
170-175	1.1	0.00	0-175	44293.7	100.00
175-180	0.4	0.00	0-180	44294.1	100.00

[Additional Test]

Test Item	Test Voltage (V)	Frequency (Hz)	Test Result
Power Factor:	277.0	60	0.9736
Total Harmonic Distortion:	277.0	60	5.11%
Total Harmonic Distortion:	120.0	60	4.16%
Total Harmonic Distortion:	100.0	60	4.84%
Power Factor:	100.0	60	0.9991

6. Product Photo



7. Product Test orientation in the Goniophotometer



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