

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai, China

Test Model: 3.5PLS/827/HYB/GX23

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Carl Du <i>Carl Du</i>
Report Number:	RKS170301001-10
Test Date:	2017-03-06 to 2017-03-08
Report Date:	2017-03-09
Reviewed By:	Blake Zhang <i>Blake Zhang</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax: +86-0769-86858588
Test Facility:	Test facility was located at No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.
Accreditation:	The IAS Accreditation Number TL-460.

1. Product Description

General Information:

One sample was received on 2017-03-02 and used for testing.

Model Tested: 3.5PLS/827/HYB/GX23
 Manufacturer: GREEN CREATIVE LTD
 Brand Name: GREEN CREATIVE
 Product Designation: LED Lamp
 Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120-277 VAC 60Hz
 Rated Power: 3.5W
 Nominal CCT: 2700K
 Nominal Lumen Output: 280 lm
 Nominal CRI: 80

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	SENSING	UI2008	908735	10.0-600.0V	2017-03-03	2018-03-02
Spectral photometer	SENSING	SPR3000	s0902024	350nm~800nm	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	G100283CA8351158	24V/100W	2016-08-26	2017-08-25
Thermal Meter	SENSING	N/A	N/A	25°C	2016-03-21	2017-03-20
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	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
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ 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 $U=2.3\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=23\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.3(K=2)$, 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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. 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_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: **0.5hour**

Test orientation: **Baseup**

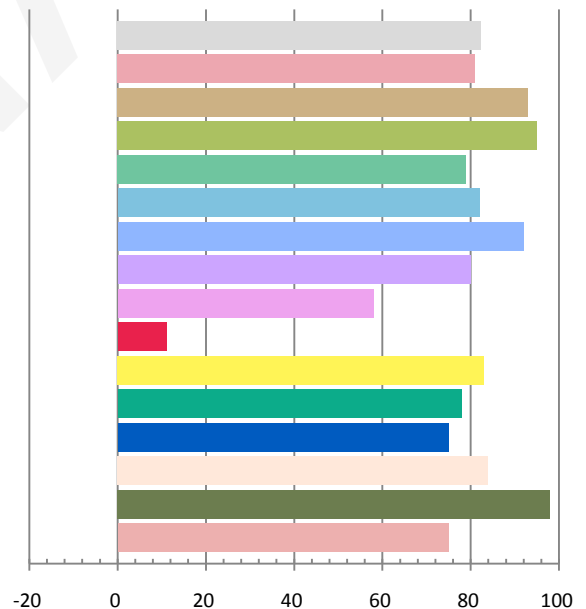
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.1	60	0.0283	3.34	0.9837	309.4	92.65

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
0.967	2755	-0.00247	0.4514	0.4020	0.2608	0.5228

Color Rendering Index

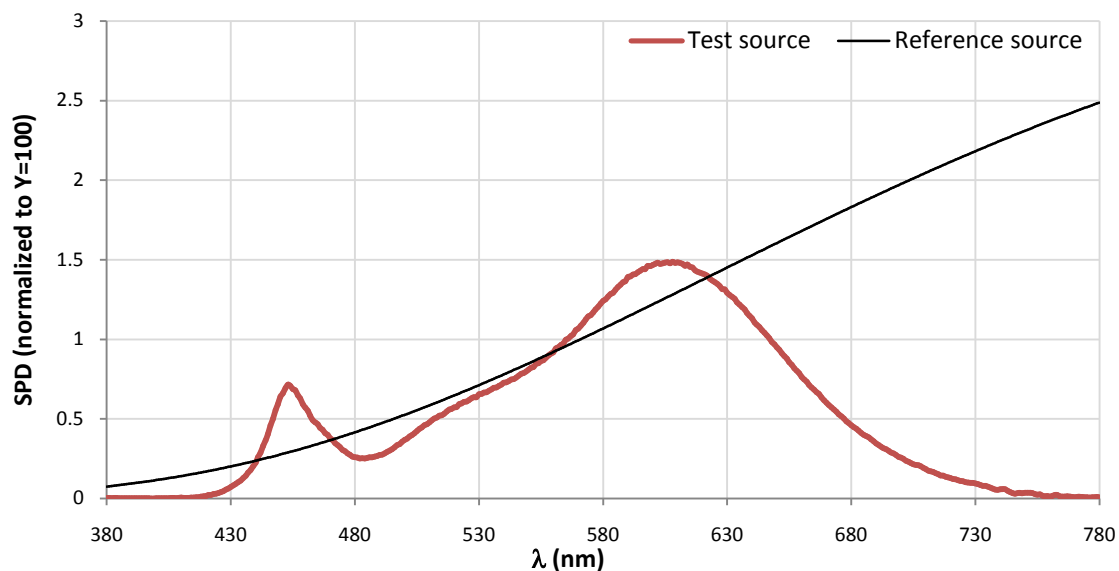
Ra			
82.4			
R1	R2	R3	R4
81	93	95	79
R5	R6	R7	R8
82	92	80	58
R9	R10	R11	R12
11	83	78	75
R13	R14	R15	
84	98	75	



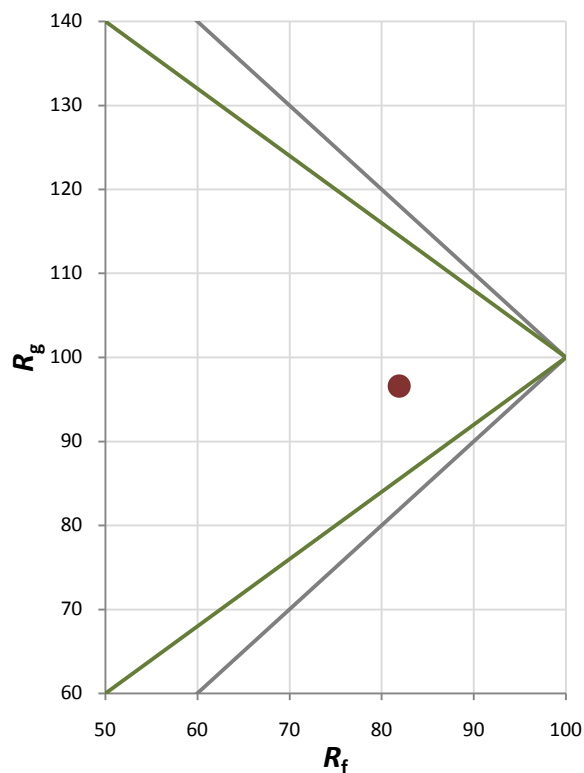
Fidelity Index and Gamut Index

Fidelity Index R_f	82
Gamut Index R_g	97

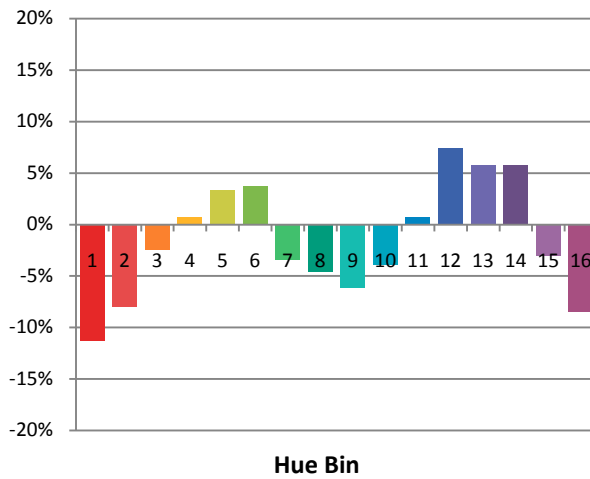
Spectral Power Distribution Comparison



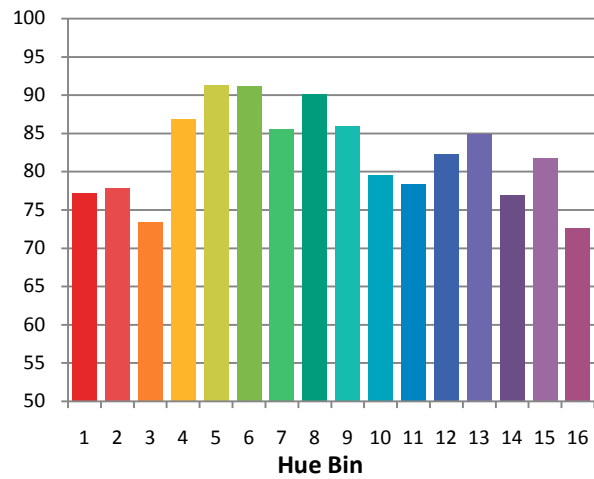
Plot of R_g versus R_f



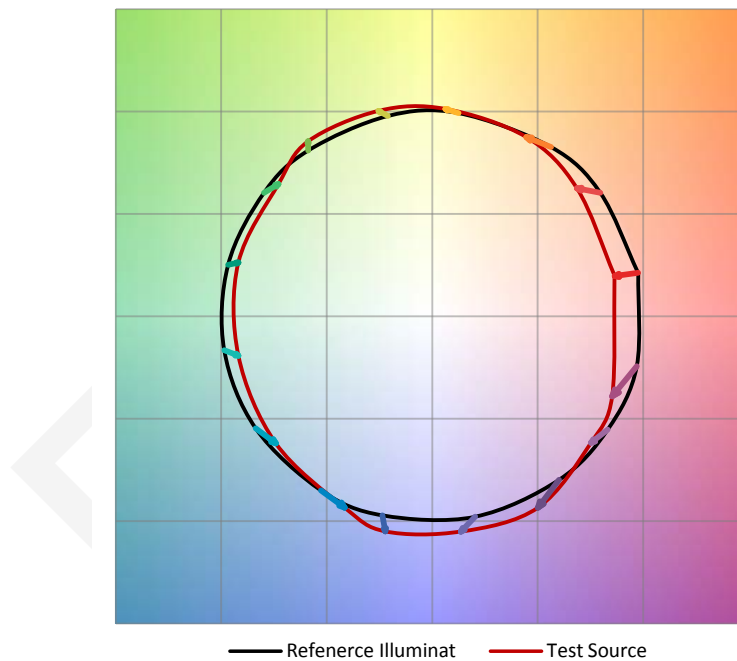
Chroma Shift by Hue



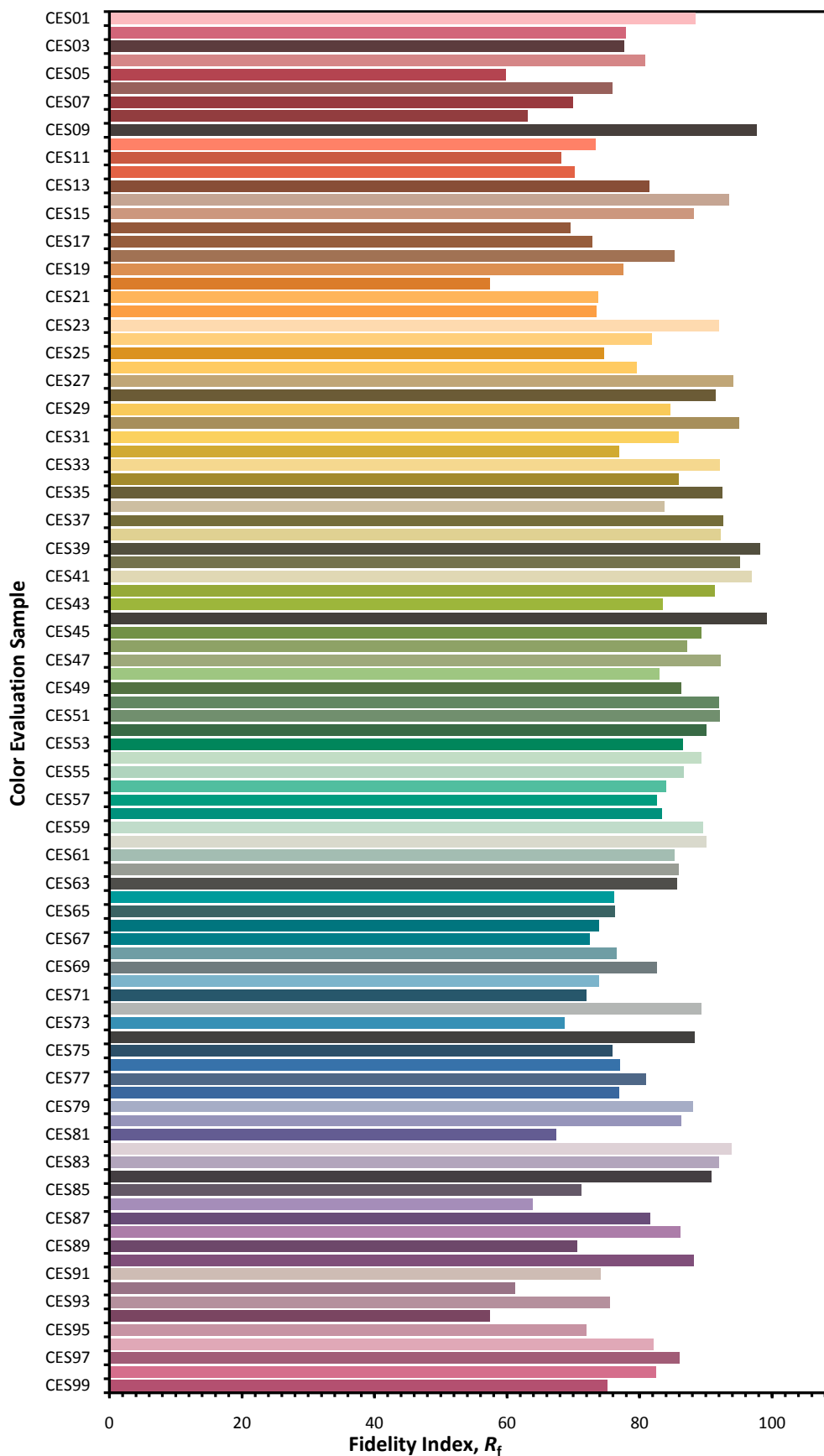
R_t by Hue



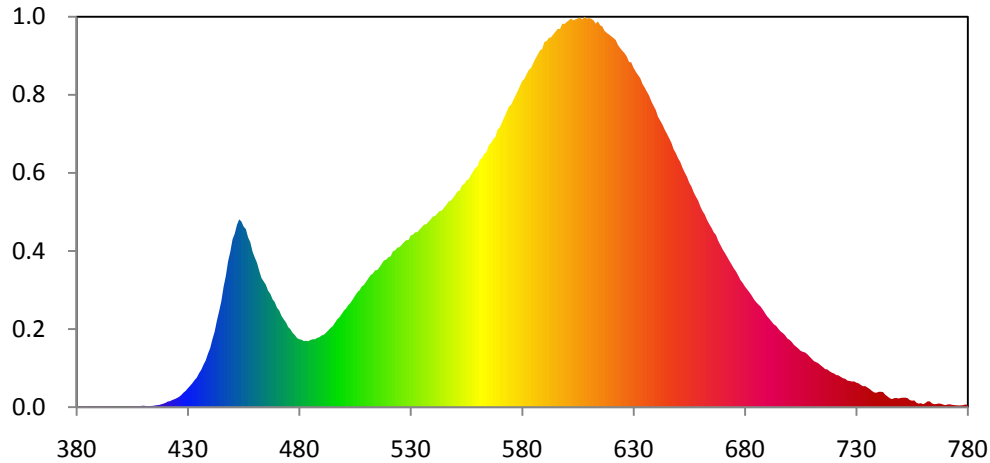
Color Vector Graphic



Color Fidelity by CES Sample



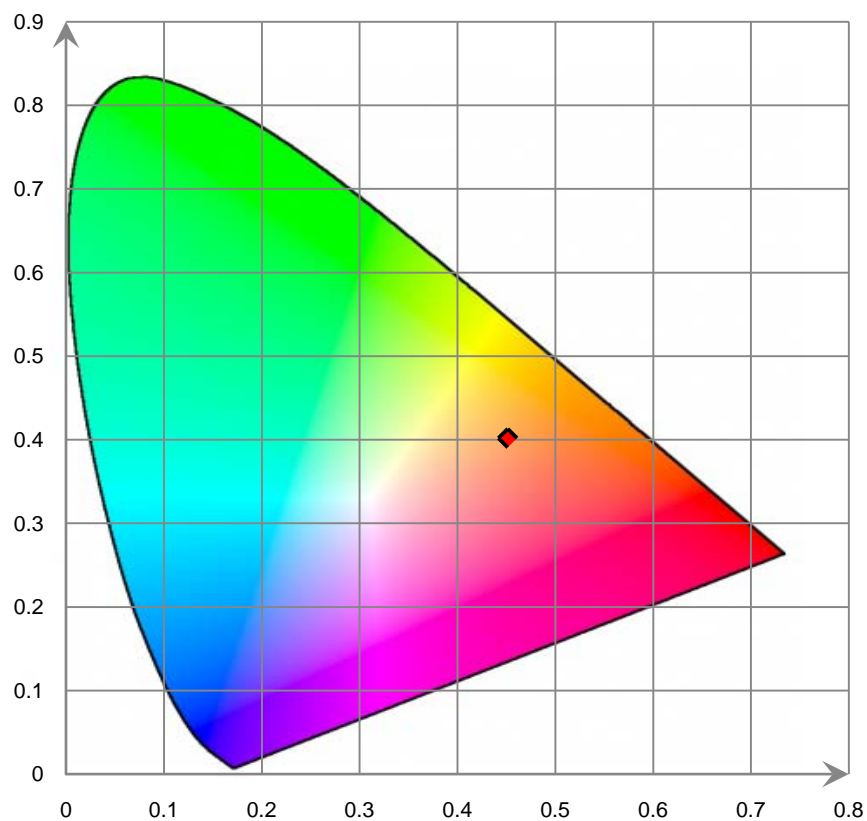
Relative Spectral Power Distribution



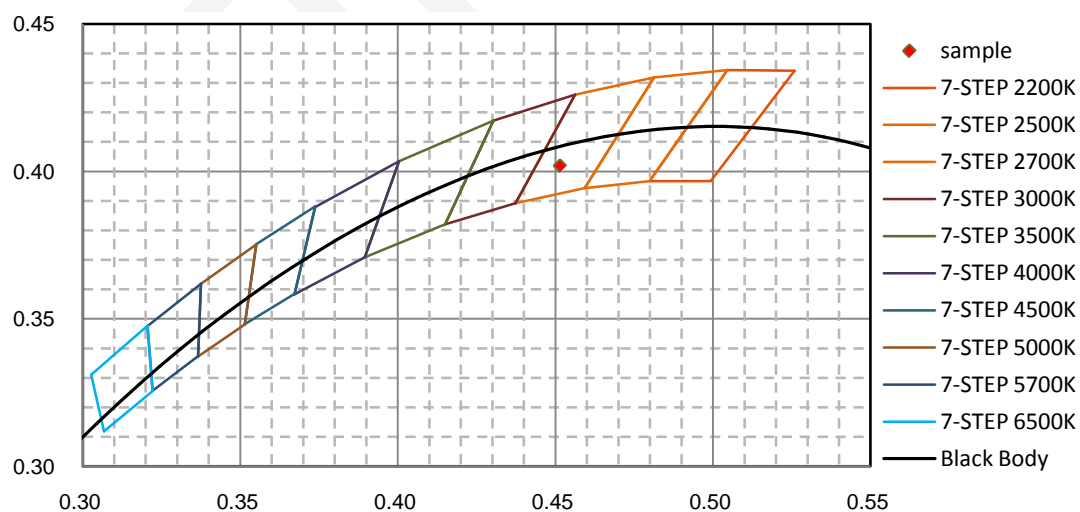
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.820E-02	421	9.740E-02	462	2.355E+00	503	1.801E+00	544	3.394E+00
381	1.720E-02	422	1.037E-01	463	2.230E+00	504	1.861E+00	545	3.446E+00
382	1.270E-02	423	1.244E-01	464	2.171E+00	505	1.923E+00	546	3.494E+00
383	1.340E-02	424	1.379E-01	465	2.111E+00	506	1.980E+00	547	3.548E+00
384	1.310E-02	425	1.563E-01	466	2.008E+00	507	2.018E+00	548	3.568E+00
385	8.000E-03	426	1.778E-01	467	1.956E+00	508	2.081E+00	549	3.611E+00
386	7.900E-03	427	2.088E-01	468	1.861E+00	509	2.110E+00	550	3.666E+00
387	7.400E-03	428	2.505E-01	469	1.811E+00	510	2.167E+00	551	3.725E+00
388	6.700E-03	429	2.822E-01	470	1.716E+00	511	2.224E+00	552	3.740E+00
389	1.080E-02	430	3.278E-01	471	1.667E+00	512	2.280E+00	553	3.831E+00
390	1.100E-02	431	3.701E-01	472	1.575E+00	513	2.305E+00	554	3.850E+00
391	5.700E-03	432	4.153E-01	473	1.516E+00	514	2.361E+00	555	3.915E+00
392	4.100E-03	433	4.678E-01	474	1.464E+00	515	2.368E+00	556	3.935E+00
393	5.200E-03	434	5.113E-01	475	1.384E+00	516	2.417E+00	557	4.006E+00
394	7.900E-03	435	5.861E-01	476	1.345E+00	517	2.475E+00	558	4.069E+00
395	8.900E-03	436	6.468E-01	477	1.282E+00	518	2.532E+00	559	4.128E+00
396	6.600E-03	437	7.338E-01	478	1.244E+00	519	2.546E+00	560	4.158E+00
397	4.100E-03	438	8.097E-01	479	1.193E+00	520	2.590E+00	561	4.269E+00
398	2.700E-03	439	9.236E-01	480	1.173E+00	521	2.602E+00	562	4.302E+00
399	1.300E-03	440	1.021E+00	481	1.165E+00	522	2.689E+00	563	4.373E+00
400	6.900E-03	441	1.174E+00	482	1.141E+00	523	2.707E+00	564	4.404E+00
401	8.400E-03	442	1.303E+00	483	1.146E+00	524	2.754E+00	565	4.520E+00
402	8.200E-03	443	1.494E+00	484	1.138E+00	525	2.763E+00	566	4.556E+00
403	7.000E-03	444	1.657E+00	485	1.159E+00	526	2.805E+00	567	4.625E+00
404	8.300E-03	445	1.832E+00	486	1.172E+00	527	2.848E+00	568	4.667E+00
405	1.050E-02	446	2.077E+00	487	1.171E+00	528	2.883E+00	569	4.791E+00
406	1.380E-02	447	2.263E+00	488	1.196E+00	529	2.884E+00	570	4.831E+00
407	1.460E-02	448	2.513E+00	489	1.208E+00	530	2.965E+00	571	4.920E+00
408	1.300E-02	449	2.679E+00	490	1.238E+00	531	2.977E+00	572	5.003E+00
409	2.150E-02	450	2.894E+00	491	1.250E+00	532	3.017E+00	573	5.092E+00
410	2.540E-02	451	2.995E+00	492	1.286E+00	533	3.023E+00	574	5.184E+00
411	2.070E-02	452	3.145E+00	493	1.324E+00	534	3.067E+00	575	5.218E+00
412	1.870E-02	453	3.241E+00	494	1.368E+00	535	3.109E+00	576	5.298E+00
413	2.030E-02	454	3.204E+00	495	1.398E+00	536	3.151E+00	577	5.377E+00
414	2.250E-02	455	3.117E+00	496	1.456E+00	537	3.158E+00	578	5.454E+00
415	2.790E-02	456	3.074E+00	497	1.516E+00	538	3.202E+00	579	5.541E+00
416	3.420E-02	457	2.931E+00	498	1.551E+00	539	3.244E+00	580	5.627E+00
417	3.780E-02	458	2.846E+00	499	1.607E+00	540	3.291E+00	581	5.667E+00
418	4.980E-02	459	2.686E+00	500	1.666E+00	541	3.301E+00	582	5.747E+00
419	6.150E-02	460	2.583E+00	501	1.704E+00	542	3.346E+00	583	5.821E+00
420	7.590E-02	461	2.493E+00	502	1.762E+00	543	3.386E+00	584	5.854E+00

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	5.941E+00	626	6.108E+00	667	2.973E+00	708	9.146E-01	749	1.498E-01
586	6.019E+00	627	6.050E+00	668	2.873E+00	709	8.737E-01	750	1.601E-01
587	6.086E+00	628	5.958E+00	669	2.798E+00	710	8.335E-01	751	1.637E-01
588	6.158E+00	629	5.950E+00	670	2.725E+00	711	7.946E-01	752	1.647E-01
589	6.182E+00	630	5.858E+00	671	2.662E+00	712	7.763E-01	753	1.557E-01
590	6.304E+00	631	5.792E+00	672	2.597E+00	713	7.570E-01	754	1.226E-01
591	6.319E+00	632	5.734E+00	673	2.527E+00	714	7.214E-01	755	1.126E-01
592	6.374E+00	633	5.680E+00	674	2.464E+00	715	6.927E-01	756	1.172E-01
593	6.385E+00	634	5.581E+00	675	2.396E+00	716	6.570E-01	757	7.740E-02
594	6.436E+00	635	5.517E+00	676	2.342E+00	717	6.516E-01	758	6.130E-02
595	6.481E+00	636	5.446E+00	677	2.273E+00	718	6.201E-01	759	6.890E-02
596	6.530E+00	637	5.377E+00	678	2.193E+00	719	5.960E-01	760	5.140E-02
597	6.528E+00	638	5.278E+00	679	2.144E+00	720	5.820E-01	761	7.170E-02
598	6.618E+00	639	5.202E+00	680	2.083E+00	721	5.547E-01	762	1.004E-01
599	6.615E+00	640	5.128E+00	681	2.033E+00	722	5.494E-01	763	1.000E-01
600	6.647E+00	641	5.012E+00	682	1.984E+00	723	5.229E-01	764	6.380E-02
601	6.678E+00	642	4.944E+00	683	1.929E+00	724	5.003E-01	765	5.170E-02
602	6.707E+00	643	4.876E+00	684	1.864E+00	725	4.901E-01	766	5.550E-02
603	6.676E+00	644	4.789E+00	685	1.815E+00	726	4.595E-01	767	6.370E-02
604	6.695E+00	645	4.717E+00	686	1.774E+00	727	4.516E-01	768	5.790E-02
605	6.710E+00	646	4.642E+00	687	1.738E+00	728	4.431E-01	769	4.550E-02
606	6.724E+00	647	4.563E+00	688	1.685E+00	729	4.444E-01	770	3.470E-02
607	6.690E+00	648	4.451E+00	689	1.625E+00	730	4.236E-01	771	4.690E-02
608	6.739E+00	649	4.384E+00	690	1.566E+00	731	4.117E-01	772	4.920E-02
609	6.705E+00	650	4.297E+00	691	1.523E+00	732	3.836E-01	773	4.090E-02
610	6.716E+00	651	4.231E+00	692	1.476E+00	733	3.615E-01	774	3.580E-02
611	6.704E+00	652	4.130E+00	693	1.430E+00	734	3.638E-01	775	3.300E-02
612	6.678E+00	653	4.050E+00	694	1.404E+00	735	3.393E-01	776	2.940E-02
613	6.620E+00	654	3.976E+00	695	1.353E+00	736	3.134E-01	777	3.190E-02
614	6.657E+00	655	3.875E+00	696	1.307E+00	737	2.808E-01	778	3.600E-02
615	6.592E+00	656	3.808E+00	697	1.279E+00	738	2.545E-01	779	4.620E-02
616	6.571E+00	657	3.709E+00	698	1.242E+00	739	2.488E-01	780	3.780E-02
617	6.494E+00	658	3.634E+00	699	1.187E+00	740	2.645E-01		
618	6.460E+00	659	3.566E+00	700	1.162E+00	741	2.664E-01		
619	6.432E+00	660	3.464E+00	701	1.126E+00	742	2.602E-01		
620	6.402E+00	661	3.384E+00	702	1.075E+00	743	2.141E-01		
621	6.370E+00	662	3.323E+00	703	1.044E+00	744	1.858E-01		
622	6.338E+00	663	3.231E+00	704	1.011E+00	745	1.549E-01		
623	6.252E+00	664	3.160E+00	705	9.727E-01	746	1.394E-01		
624	6.198E+00	665	3.097E+00	706	9.549E-01	747	1.554E-01		
625	6.151E+00	666	3.019E+00	707	9.441E-01	748	1.587E-01		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

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

Test orientation: **Baseup**

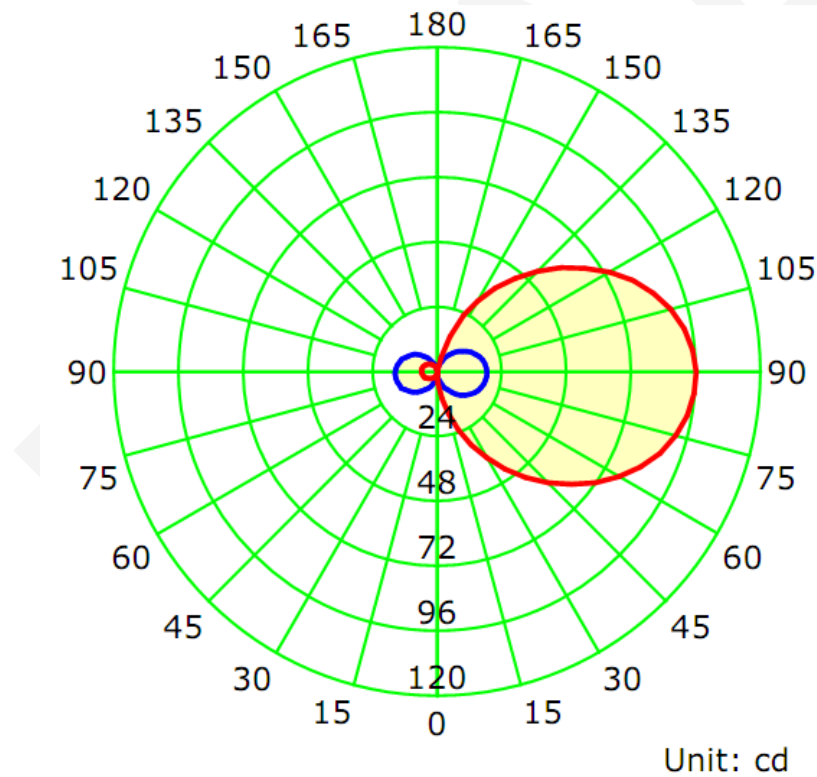
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0280	3.33	0.9870

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
312.5	93.84	96.0	5.31	7.96

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	273.0	175.1	176.0	173.2	199.3
Field Angle (10% I_{max}):	328.3	170.9	172.2	272.1	235.9

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1	1	1	1	1	1	1	1
5.0°	2	3	4	5	5	4	4	3
10.0°	3	5	7	9	10	9	7	5
15.0°	4	7	12	15	16	15	11	7
20.0°	5	10	16	22	23	21	16	10
25.0°	7	14	21	28	30	27	21	12
30.0°	8	17	26	34	37	33	25	15
35.0°	10	20	31	41	44	39	30	18
40.0°	11	23	36	47	51	46	35	21
45.0°	12	26	41	54	58	52	39	23
50.0°	14	29	46	60	65	58	44	26
55.0°	15	31	50	66	72	64	48	28
60.0°	16	33	54	71	78	69	52	30
65.0°	17	36	57	76	83	74	55	32
70.0°	18	37	60	80	88	78	58	34
75.0°	18	39	63	83	92	81	60	35
80.0°	18	40	64	86	94	83	62	35
85.0°	19	40	65	87	96	84	62	36
90.0°	19	40	65	87	96	85	62	36
95.0°	18	40	65	87	95	84	62	35
100.0°	18	39	63	85	93	82	60	34
105.0°	17	38	61	82	90	79	58	33
110.0°	17	36	58	78	85	75	55	32
115.0°	16	34	55	73	80	70	52	30
120.0°	15	31	51	68	74	65	48	27
125.0°	14	28	46	61	67	59	44	25
130.0°	12	26	42	55	60	53	39	22
135.0°	11	22	37	49	53	46	34	19
140.0°	9	19	32	42	45	40	30	16
145.0°	8	16	26	35	38	33	25	13
150.0°	6	13	21	28	31	27	19	11
155.0°	5	9	16	21	23	20	14	8
160.0°	3	6	10	13	14	12	9	5
165.0°	2	4	5	6	6	5	4	3
170.0°	1	1	1	1	0	0	1	1
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1	1	1	1	1	1	1	1
5.0°	2	1	1	0	0	0	1	1
10.0°	3	1	1	1	0	1	1	1
15.0°	4	2	1	1	1	1	1	2
20.0°	5	2	2	1	1	1	2	3
25.0°	6	3	2	2	2	2	2	3
30.0°	7	4	3	3	2	2	3	4
35.0°	9	4	3	3	3	3	3	5
40.0°	10	5	4	3	3	3	4	6
45.0°	11	6	4	4	4	4	4	6
50.0°	12	6	5	4	4	4	5	7
55.0°	13	7	5	5	5	5	5	8
60.0°	14	7	5	5	5	5	6	8
65.0°	15	8	6	5	5	5	6	9
70.0°	15	8	6	6	6	6	6	9
75.0°	15	8	6	6	6	6	6	9
80.0°	16	8	6	6	6	6	7	9
85.0°	16	8	6	6	6	6	7	10
90.0°	16	8	6	6	6	6	7	10
95.0°	16	8	6	6	6	6	7	9
100.0°	15	8	6	6	6	6	7	9
105.0°	15	8	6	6	6	6	6	9
110.0°	14	8	6	6	6	6	6	9
115.0°	13	7	6	6	6	6	6	8
120.0°	12	7	5	5	5	5	6	8
125.0°	11	6	5	5	5	5	5	7
130.0°	10	6	4	5	5	5	5	6
135.0°	9	5	4	4	4	4	4	6
140.0°	8	4	4	4	4	4	4	5
145.0°	6	4	3	3	3	3	3	4
150.0°	5	3	3	3	3	3	3	3
155.0°	4	2	2	2	2	2	2	3
160.0°	2	2	2	2	2	2	2	2
165.0°	1	1	1	1	1	1	1	1
170.0°	1	0	1	1	1	0	0	1
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	0.0	0.01	0-5	0.0	0.01
5-10	0.2	0.07	0-10	0.3	0.08
10-15	0.6	0.19	0-15	0.9	0.28
15-20	1.2	0.39	0-20	2.1	0.67
20-25	2.1	0.67	0-25	4.2	1.34
25-30	3.2	1.02	0-30	7.4	2.37
30-35	4.5	1.44	0-35	11.9	3.81
35-40	6.0	1.91	0-40	17.9	5.72
40-45	7.6	2.43	0-45	25.5	8.15
45-50	9.3	2.97	0-50	34.7	11.12
50-55	11.0	3.53	0-55	45.8	14.64
55-60	12.7	4.07	0-60	58.5	18.72
60-65	14.4	4.60	0-65	72.9	23.31
65-70	15.8	5.07	0-70	88.7	28.38
70-75	17.1	5.46	0-75	105.8	33.84
75-80	18.0	5.77	0-80	123.8	39.61
80-85	18.7	5.97	0-85	142.4	45.58
85-90	18.9	6.06	0-90	161.4	51.64
90-95	18.9	6.04	0-95	180.3	57.68
95-100	18.4	5.90	0-100	198.7	63.58
100-105	17.7	5.65	0-105	216.3	69.22
105-110	16.6	5.30	0-110	232.9	74.52
110-115	15.2	4.86	0-115	248.1	79.38
115-120	13.6	4.36	0-120	261.7	83.74
120-125	11.9	3.81	0-125	273.6	87.55
125-130	10.1	3.25	0-130	283.8	90.80
130-135	8.4	2.69	0-135	292.2	93.49
135-140	6.7	2.14	0-140	298.9	95.63
140-145	5.1	1.64	0-145	304.0	97.27
145-150	3.7	1.19	0-150	307.7	98.46
150-155	2.5	0.80	0-155	310.2	99.25
155-160	1.5	0.47	0-160	311.6	99.72
160-165	0.7	0.21	0-165	312.3	99.93
165-170	0.2	0.06	0-170	312.5	99.99
170-175	0.0	0.01	0-175	312.5	100.00
175-180	0.0	0.00	0-180	312.5	100.00

6. Product Photo



7. Product Test orientation in the Goniophotometer



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