



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 6PAR16DIM/827FL35

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Daniel Duan <i>Daniel Duan</i>
Report Number:	RKS160826004-10
Test Date:	2016-08-26
Report Date:	2016-08-31
Reviewed By:	Jeanne Han/EE Manager <i>Jeanne Han</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China. Tel: +86-0769-86858888 Fax: +86-0769-86858588
Test Facility:	Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.
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 2016-08-26 and used for testing.

Model Tested: 6PAR16DIM/827FL35
Manufacturer: GREEN CREATIVE LTD
Brand Name: GREEN CREATIVE
Product Designation: LED PAR16
Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120 VAC 60Hz
Rated Power: 6W
Nominal CCT: 2700K
Nominal Lumen Output: 480 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
2.0m integrating sphere	EVERFINE	R98	11010018	R98	2015-11-09	2016-11-08
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2016-03-10	2017-03-09
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
Temperature/humidity/clock	Victor	VC230	EE023	0~40°C0~90%	2016-03-21	2017-03-20
Standard Light Source	SENSING	N/A	LSD090808	N/A	2015-09-25	2016-09-24
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010-YF	1011001T	30V/5A	2016-03-04	2017-03-03
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2016-03-04	2017-03-03
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2016-03-04	2017-03-03
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600V	2016-03-04	2017-03-03
Goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2016-03-10	2017-03-09
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	2015-09-08	2016-09-07

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 $U=1.8\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=20\text{K}$ ($K=2$), 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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. 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_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: **0.5hour**

Test orientation: **Downward**

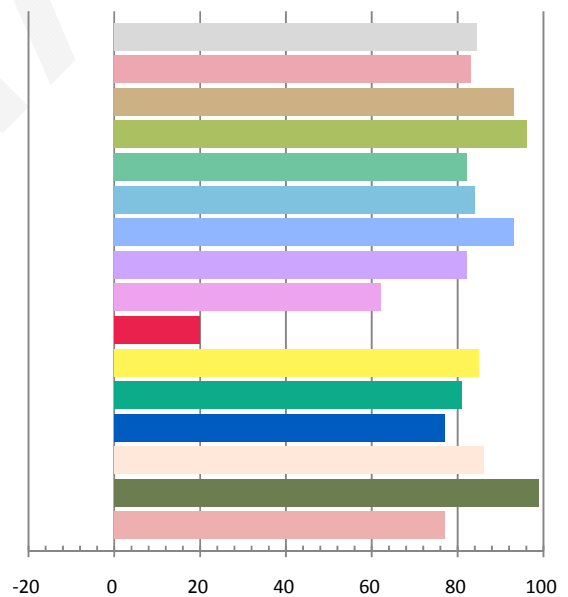
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.0561	5.62	0.835	528.3	94.05

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
1.689	2714	-0.00024	0.4583	0.4096	0.2619	0.5267

Color Rendering Index

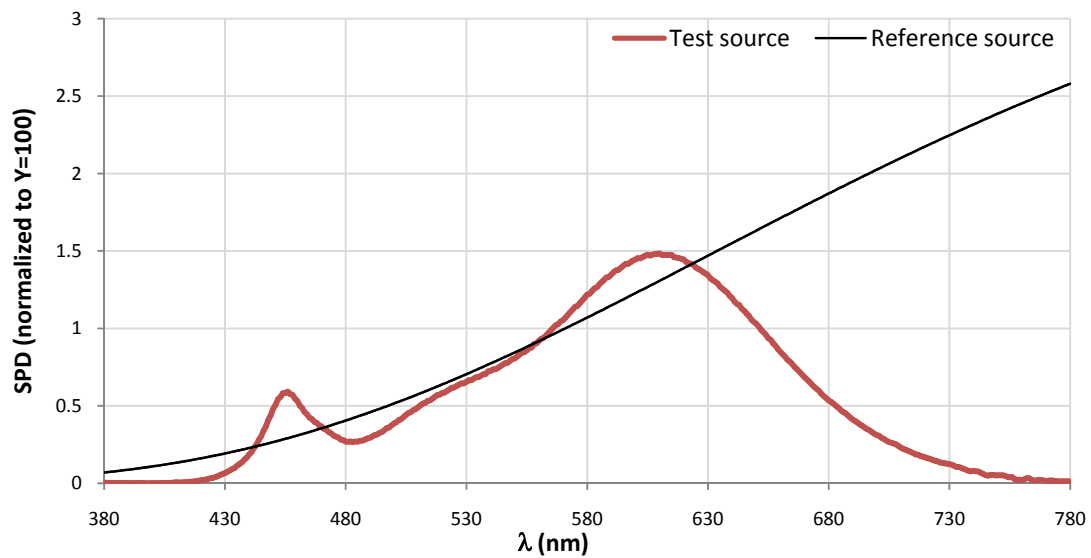
Ra			
84.4			
R1	R2	R3	R4
83	93	96	82
R5	R6	R7	R8
84	93	82	62
R9	R10	R11	R12
20	85	81	77
R13	R14	R15	
86	99	77	



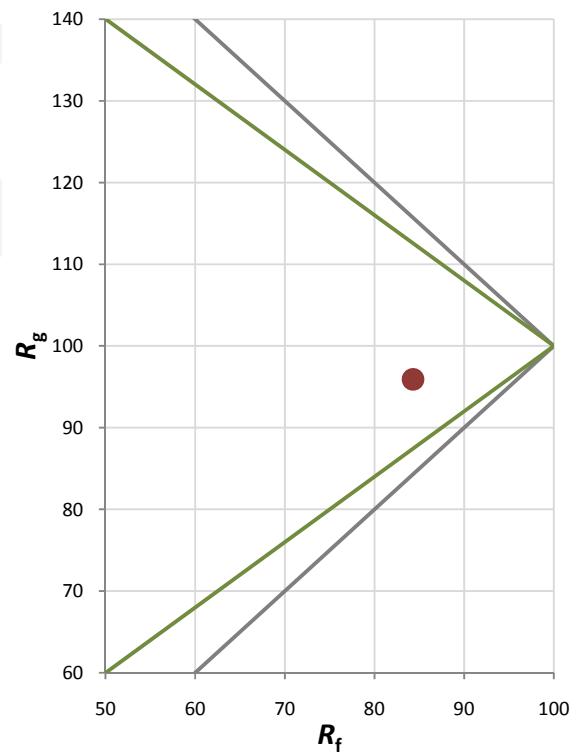
Fidelity Index and Gamut Index

Fidelity Index R_f	84
Gamut Index R_g	96

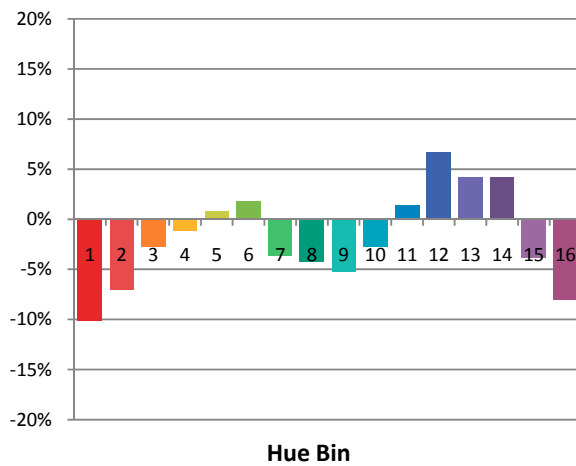
Spectral Power Distribution Comparison



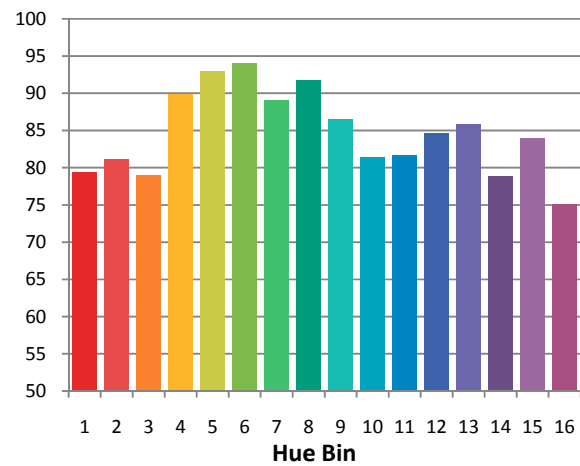
Plot of R_g versus R_f



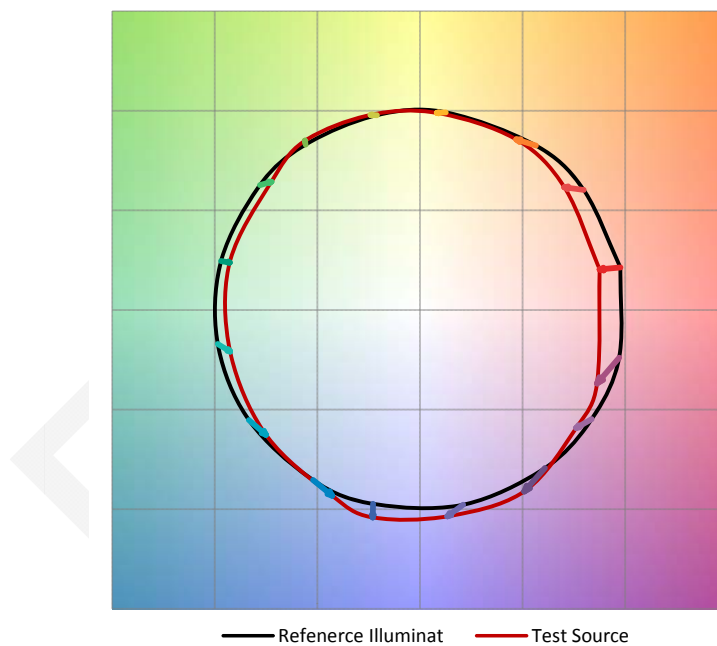
Chroma Shift by Hue



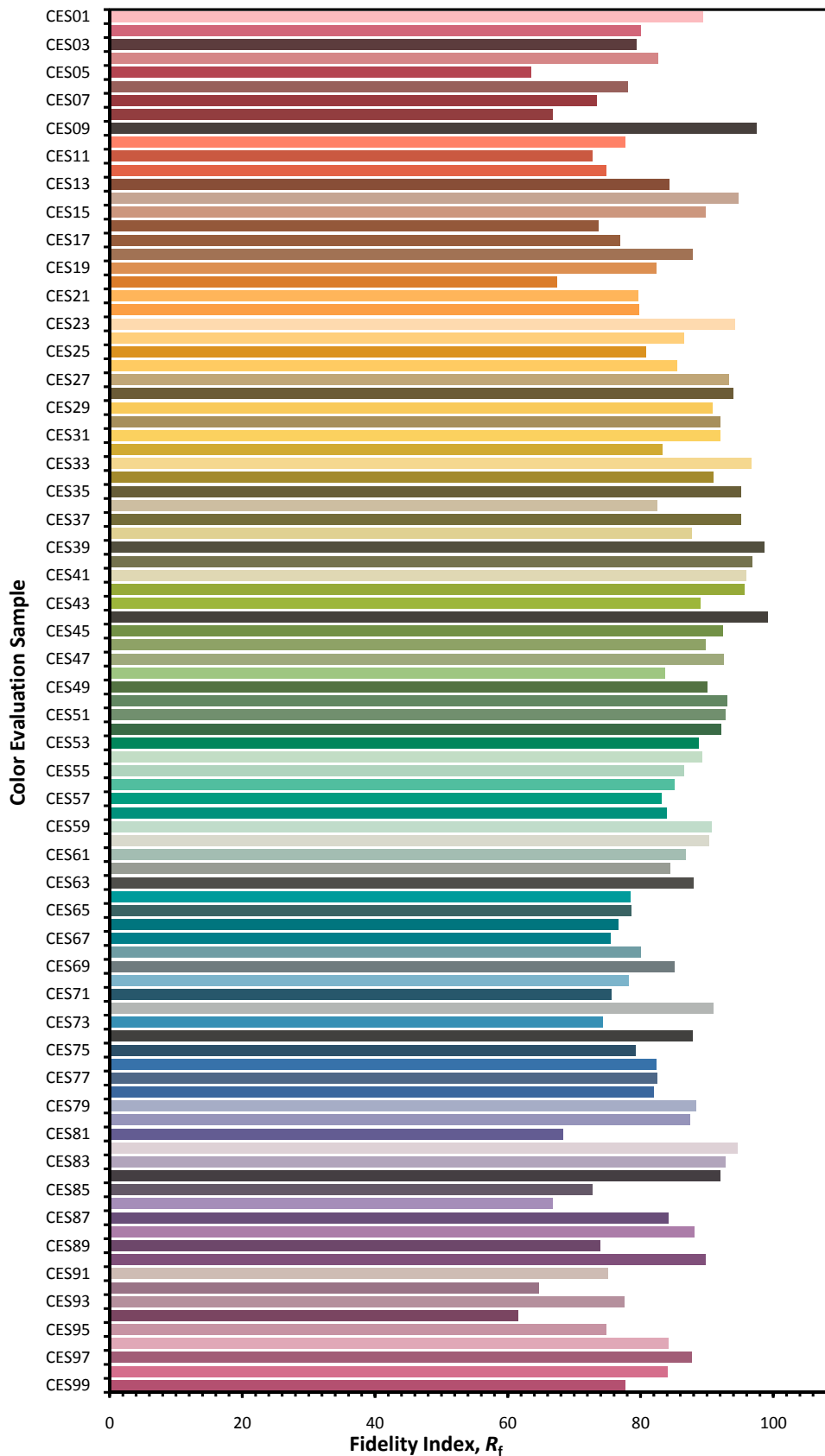
R_f by Hue



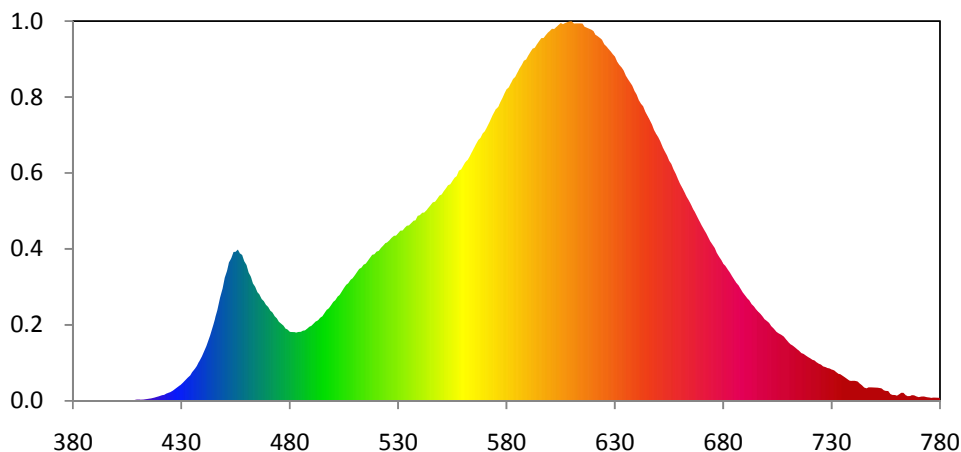
Color Vector Graphic



Color Fidelity by CES Sample



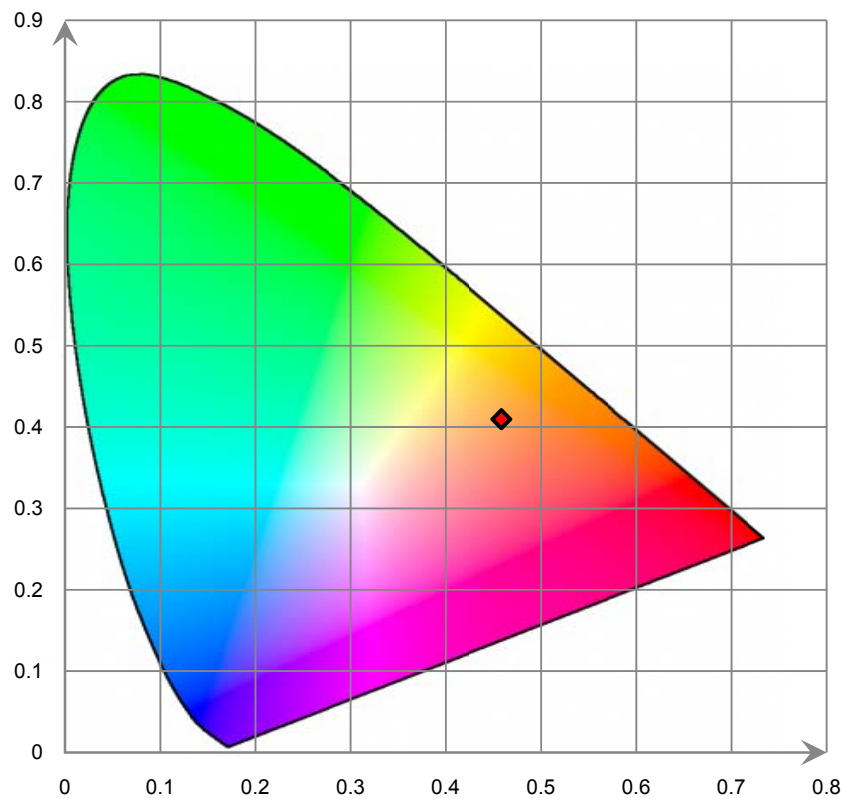
Relative Spectral Power Distribution



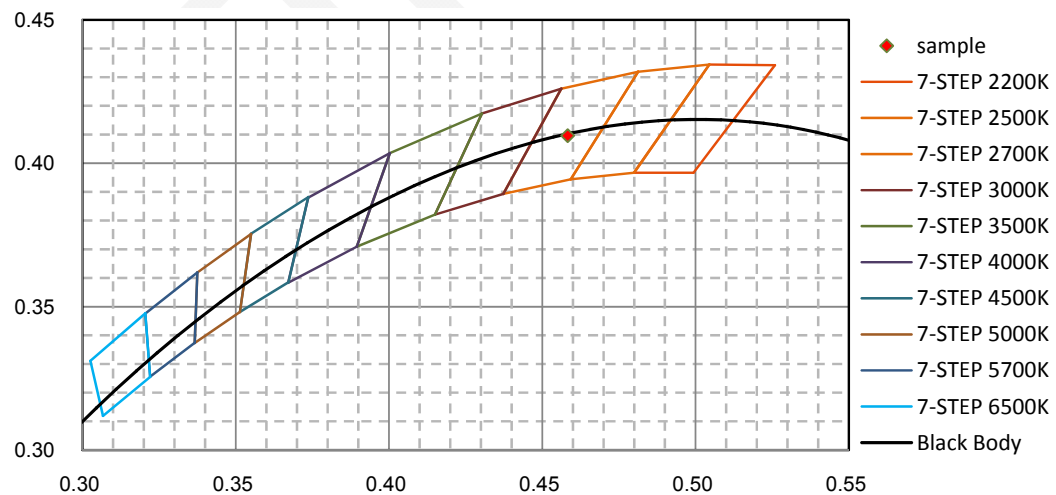
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.230E-02	421	1.761E-01	462	3.755E+00	503	3.207E+00	544	5.839E+00
381	2.850E-02	422	1.848E-01	463	3.553E+00	504	3.313E+00	545	5.920E+00
382	2.100E-02	423	2.226E-01	464	3.450E+00	505	3.415E+00	546	5.999E+00
383	2.200E-02	424	2.479E-01	465	3.287E+00	506	3.509E+00	547	6.020E+00
384	2.170E-02	425	2.710E-01	466	3.214E+00	507	3.557E+00	548	6.110E+00
385	1.280E-02	426	3.141E-01	467	3.077E+00	508	3.661E+00	549	6.204E+00
386	1.190E-02	427	3.524E-01	468	3.018E+00	509	3.707E+00	550	6.238E+00
387	1.320E-02	428	4.124E-01	469	2.901E+00	510	3.800E+00	551	6.335E+00
388	1.650E-02	429	4.582E-01	470	2.844E+00	511	3.893E+00	552	6.426E+00
389	2.080E-02	430	5.053E-01	471	2.726E+00	512	3.988E+00	553	6.515E+00
390	2.020E-02	431	5.778E-01	472	2.672E+00	513	4.026E+00	554	6.546E+00
391	1.200E-02	432	6.380E-01	473	2.559E+00	514	4.116E+00	555	6.644E+00
392	8.900E-03	433	7.123E-01	474	2.501E+00	515	4.148E+00	556	6.746E+00
393	1.110E-02	434	7.687E-01	475	2.388E+00	516	4.235E+00	557	6.792E+00
394	1.780E-02	435	8.748E-01	476	2.334E+00	517	4.325E+00	558	6.958E+00
395	1.970E-02	436	9.582E-01	477	2.282E+00	518	4.412E+00	559	6.996E+00
396	1.400E-02	437	1.042E+00	478	2.186E+00	519	4.433E+00	560	7.106E+00
397	9.400E-03	438	1.177E+00	479	2.155E+00	520	4.512E+00	561	7.222E+00
398	6.500E-03	439	1.278E+00	480	2.088E+00	521	4.536E+00	562	7.276E+00
399	3.100E-03	440	1.431E+00	481	2.076E+00	522	4.617E+00	563	7.392E+00
400	1.230E-02	441	1.561E+00	482	2.084E+00	523	4.691E+00	564	7.516E+00
401	1.390E-02	442	1.760E+00	483	2.062E+00	524	4.769E+00	565	7.646E+00
402	1.220E-02	443	1.921E+00	484	2.087E+00	525	4.791E+00	566	7.768E+00
403	1.140E-02	444	2.158E+00	485	2.085E+00	526	4.863E+00	567	7.891E+00
404	1.450E-02	445	2.346E+00	486	2.124E+00	527	4.929E+00	568	7.949E+00
405	1.810E-02	446	2.626E+00	487	2.133E+00	528	4.990E+00	569	8.085E+00
406	2.320E-02	447	2.846E+00	488	2.184E+00	529	4.996E+00	570	8.149E+00
407	2.650E-02	448	3.165E+00	489	2.243E+00	530	5.071E+00	571	8.276E+00
408	2.280E-02	449	3.399E+00	490	2.271E+00	531	5.142E+00	572	8.414E+00
409	4.050E-02	450	3.719E+00	491	2.338E+00	532	5.150E+00	573	8.552E+00
410	5.040E-02	451	3.919E+00	492	2.406E+00	533	5.225E+00	574	8.684E+00
411	4.280E-02	452	4.192E+00	493	2.435E+00	534	5.295E+00	575	8.813E+00
412	4.010E-02	453	4.315E+00	494	2.512E+00	535	5.303E+00	576	8.871E+00
413	4.680E-02	454	4.500E+00	495	2.557E+00	536	5.372E+00	577	9.008E+00
414	5.720E-02	455	4.507E+00	496	2.655E+00	537	5.446E+00	578	9.142E+00
415	6.610E-02	456	4.571E+00	497	2.752E+00	538	5.458E+00	579	9.282E+00
416	7.800E-02	457	4.455E+00	498	2.797E+00	539	5.593E+00	580	9.419E+00
417	9.170E-02	458	4.410E+00	499	2.893E+00	540	5.613E+00	581	9.471E+00
418	1.106E-01	459	4.222E+00	500	2.992E+00	541	5.687E+00	582	9.602E+00
419	1.293E-01	460	4.111E+00	501	3.048E+00	542	5.692E+00	583	9.734E+00
420	1.499E-01	461	3.883E+00	502	3.150E+00	543	5.760E+00	584	9.792E+00

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	9.927E+00	626	1.071E+01	667	5.690E+00	708	1.935E+00	749	3.979E-01
586	1.005E+01	627	1.064E+01	668	5.551E+00	709	1.851E+00	750	3.965E-01
587	1.016E+01	628	1.056E+01	669	5.429E+00	710	1.777E+00	751	3.976E-01
588	1.028E+01	629	1.048E+01	670	5.298E+00	711	1.711E+00	752	3.974E-01
589	1.031E+01	630	1.040E+01	671	5.190E+00	712	1.674E+00	753	3.752E-01
590	1.043E+01	631	1.025E+01	672	5.073E+00	713	1.621E+00	754	3.223E-01
591	1.054E+01	632	1.015E+01	673	4.951E+00	714	1.563E+00	755	2.993E-01
592	1.064E+01	633	1.007E+01	674	4.817E+00	715	1.511E+00	756	3.037E-01
593	1.067E+01	634	9.985E+00	675	4.725E+00	716	1.447E+00	757	2.145E-01
594	1.077E+01	635	9.824E+00	676	4.623E+00	717	1.423E+00	758	1.780E-01
595	1.087E+01	636	9.723E+00	677	4.474E+00	718	1.375E+00	759	1.852E-01
596	1.096E+01	637	9.621E+00	678	4.360E+00	719	1.331E+00	760	1.588E-01
597	1.096E+01	638	9.525E+00	679	4.258E+00	720	1.290E+00	761	1.979E-01
598	1.105E+01	639	9.366E+00	680	4.143E+00	721	1.248E+00	762	2.478E-01
599	1.113E+01	640	9.257E+00	681	4.072E+00	722	1.222E+00	763	2.508E-01
600	1.118E+01	641	9.087E+00	682	3.973E+00	723	1.168E+00	764	1.806E-01
601	1.125E+01	642	8.971E+00	683	3.876E+00	724	1.127E+00	765	1.459E-01
602	1.124E+01	643	8.899E+00	684	3.770E+00	725	1.097E+00	766	1.441E-01
603	1.130E+01	644	8.731E+00	685	3.663E+00	726	1.047E+00	767	1.780E-01
604	1.136E+01	645	8.617E+00	686	3.568E+00	727	1.025E+00	768	1.697E-01
605	1.142E+01	646	8.489E+00	687	3.492E+00	728	9.974E-01	769	1.426E-01
606	1.138E+01	647	8.364E+00	688	3.383E+00	729	9.838E-01	770	1.154E-01
607	1.142E+01	648	8.184E+00	689	3.275E+00	730	9.487E-01	771	1.255E-01
608	1.145E+01	649	8.069E+00	690	3.185E+00	731	9.284E-01	772	1.404E-01
609	1.146E+01	650	7.963E+00	691	3.102E+00	732	8.756E-01	773	1.312E-01
610	1.147E+01	651	7.831E+00	692	3.030E+00	733	8.209E-01	774	1.117E-01
611	1.140E+01	652	7.667E+00	693	2.932E+00	734	8.088E-01	775	1.046E-01
612	1.141E+01	653	7.543E+00	694	2.863E+00	735	7.624E-01	776	9.100E-02
613	1.141E+01	654	7.418E+00	695	2.774E+00	736	7.150E-01	777	1.044E-01
614	1.141E+01	655	7.252E+00	696	2.699E+00	737	6.689E-01	778	9.620E-02
615	1.140E+01	656	7.161E+00	697	2.640E+00	738	6.197E-01	779	1.010E-01
616	1.130E+01	657	6.990E+00	698	2.557E+00	739	6.029E-01	780	8.390E-02
617	1.127E+01	658	6.869E+00	699	2.471E+00	740	6.162E-01		
618	1.125E+01	659	6.705E+00	700	2.415E+00	741	6.032E-01		
619	1.121E+01	660	6.566E+00	701	2.362E+00	742	5.858E-01		
620	1.118E+01	661	6.439E+00	702	2.264E+00	743	5.237E-01		
621	1.106E+01	662	6.320E+00	703	2.200E+00	744	4.689E-01		
622	1.102E+01	663	6.172E+00	704	2.126E+00	745	4.074E-01		
623	1.097E+01	664	6.068E+00	705	2.061E+00	746	3.826E-01		
624	1.091E+01	665	5.942E+00	706	2.025E+00	747	4.115E-01		
625	1.078E+01	666	5.798E+00	707	1.988E+00	748	4.210E-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: **Downward**

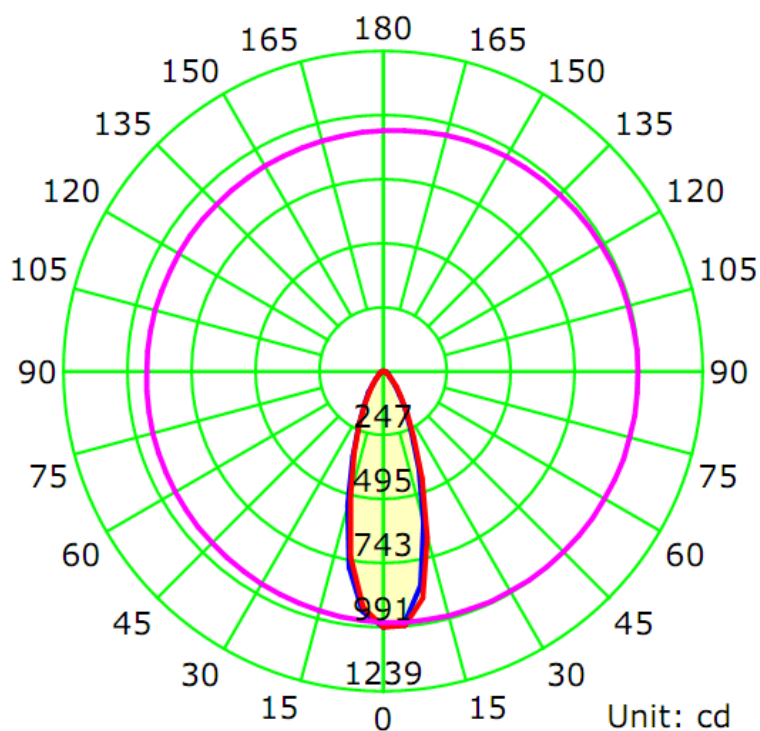
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60	0.0570	5.72	0.8410

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
538.1	94.07	991.6	0.56	0.56

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	34.0	34.1	33.9	33.8	34.0
Field Angle (10% I_{max}):	72.4	73.4	73.0	72.7	72.9

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	990	990	990	990	990	990	990	990
5.0°	973	982	990	992	988	982	969	953
10.0°	842	866	887	897	893	876	850	819
15.0°	610	642	664	674	668	647	617	583
20.0°	407	429	446	448	442	427	406	386
25.0°	264	280	291	291	286	277	264	252
30.0°	173	184	190	189	188	182	174	166
35.0°	115	121	126	126	124	121	116	109
40.0°	75	79	83	83	81	79	76	71
45.0°	49	52	54	54	53	52	50	46
50.0°	33	35	36	36	35	35	34	31
55.0°	25	25	26	27	25	25	25	23
60.0°	20	20	20	20	20	19	19	18
65.0°	15	16	16	16	16	15	15	14
70.0°	13	13	13	14	13	13	13	12
75.0°	11	11	11	12	11	11	11	10
80.0°	8	8	9	9	8	8	8	7
85.0°	5	6	6	6	6	6	5	5
90.0°	3	3	4	4	4	3	3	3
95.0°	3	3	3	3	3	3	3	2
100.0°	2	2	2	2	2	2	2	2
105.0°	2	2	2	2	2	2	2	2
110.0°	1	1	1	1	1	1	1	1
115.0°	1	1	1	1	1	1	1	1
120.0°	1	1	1	1	1	1	1	1
125.0°	1	1	1	1	1	1	1	1
130.0°	1	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

C γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	990	990	990	990	990	990	990	990
5.0°	932	921	916	915	919	930	941	954
10.0°	771	740	729	722	731	744	768	795
15.0°	537	514	502	497	498	511	529	561
20.0°	353	343	337	331	330	337	348	368
25.0°	232	227	226	223	221	225	230	240
30.0°	154	152	152	149	149	151	154	159
35.0°	102	101	101	100	100	101	103	106
40.0°	66	66	66	66	65	67	68	69
45.0°	43	43	43	43	42	44	46	45
50.0°	30	30	30	30	29	31	32	31
55.0°	22	23	22	23	22	23	24	23
60.0°	18	18	17	18	17	18	19	18
65.0°	14	15	13	14	14	14	15	13
70.0°	12	12	12	12	12	12	12	12
75.0°	10	9	9	9	9	9	10	10
80.0°	7	7	6	6	6	6	7	7
85.0°	4	4	4	4	4	4	4	4
90.0°	3	3	3	3	3	3	3	3
95.0°	2	2	2	2	2	2	2	2
100.0°	2	2	2	2	2	2	2	2
105.0°	2	2	2	1	2	2	2	2
110.0°	1	1	1	1	1	1	1	1
115.0°	1	1	1	1	1	1	1	1
120.0°	1	1	1	1	1	1	1	1
125.0°	1	1	1	1	1	1	1	1
130.0°	1	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	23.2	4.32	0-5	23.2	4.32
5-10	63.0	11.71	0-10	86.2	16.03
10-15	82.2	15.28	0-15	168.5	31.31
15-20	79.3	14.73	0-20	247.8	46.04
20-25	66.6	12.38	0-25	314.4	58.43
25-30	52.9	9.84	0-30	367.3	68.26
30-35	40.8	7.59	0-35	408.2	75.85
35-40	30.5	5.67	0-40	438.7	81.53
40-45	22.2	4.12	0-45	460.9	85.65
45-50	16.1	2.99	0-50	477.0	88.64
50-55	12.2	2.27	0-55	489.2	90.91
55-60	9.9	1.83	0-60	499.1	92.74
60-65	8.1	1.51	0-65	507.2	94.25
65-70	6.9	1.28	0-70	514.1	95.53
70-75	5.9	1.09	0-75	519.9	96.62
75-80	4.7	0.86	0-80	524.6	97.49
80-85	3.3	0.61	0-85	527.9	98.10
85-90	2.1	0.40	0-90	530.0	98.49
90-95	1.5	0.28	0-95	531.5	98.77
95-100	1.2	0.23	0-100	532.7	99.00
100-105	1.0	0.18	0-105	533.7	99.18
105-110	0.8	0.14	0-110	534.5	99.32
110-115	0.6	0.10	0-115	535.0	99.43
115-120	0.4	0.08	0-120	535.5	99.51
120-125	0.4	0.07	0-125	535.9	99.58
125-130	0.4	0.07	0-130	536.2	99.65
130-135	0.3	0.06	0-135	536.6	99.71
135-140	0.3	0.06	0-140	536.9	99.77
140-145	0.3	0.05	0-145	537.1	99.82
145-150	0.3	0.05	0-150	537.4	99.87
150-155	0.2	0.04	0-155	537.6	99.91
155-160	0.2	0.03	0-160	537.8	99.94
160-165	0.1	0.03	0-165	537.9	99.97
165-170	0.1	0.02	0-170	538.0	99.99
170-175	0.1	0.01	0-175	538.1	100.00
175-180	0.0	0.00	0-180	538.1	100.00

6. Product Photo



7. Product Test orientation in the Goniophotometer



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