



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 19PAR38HO/830FL40/277V

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Daniel Duan <i>Daniel Duan</i>
Report Number:	RKS160826008-10
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: 19PAR38HO/830FL40/277V
Manufacturer: GREEN CREATIVE LTD
Brand Name: GREEN CREATIVE
Product Designation: LED PAR38
Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120 -277VAC 60Hz
Rated Power: 19W
Nominal CCT: 3000K
Nominal Lumen Output: 1775 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	Manufacturer	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.

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**

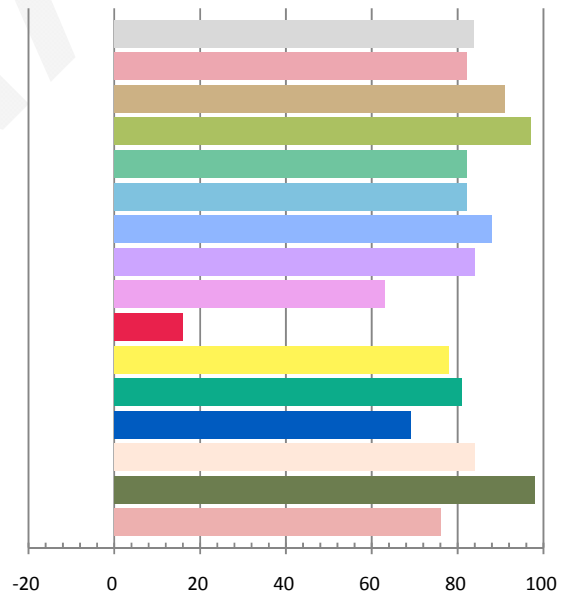
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.1	60	0.1578	18.82	0.9938	1906.5	101.28

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
5.854	3099	0.00044	0.4307	0.4029	0.2470	0.5200

Color Rendering Index

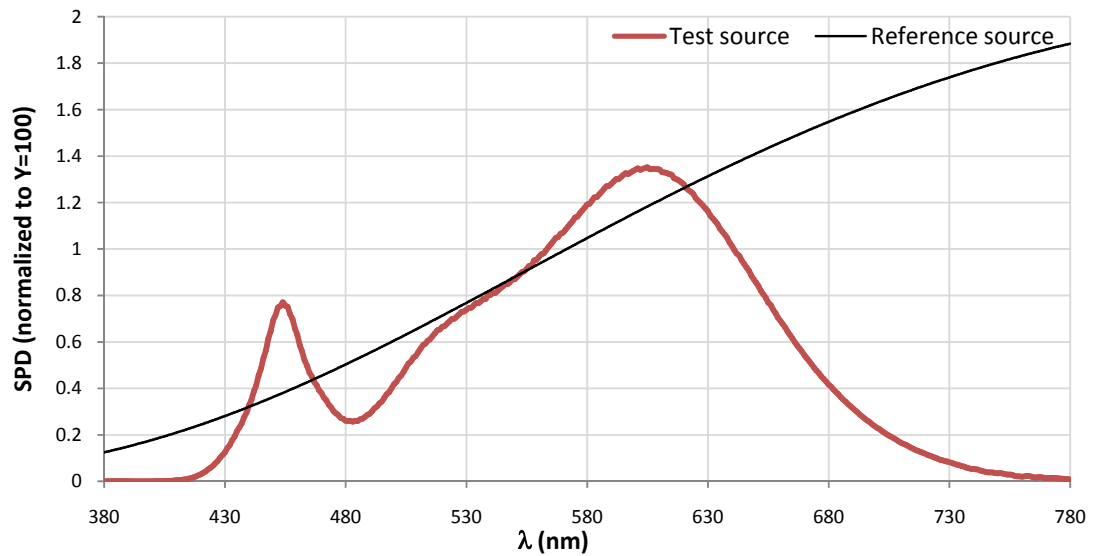
Ra 83.8			
R1 82	R2 91	R3 97	R4 82
R5 82	R6 88	R7 84	R8 63
R9 16	R10 78	R11 81	R12 69
R13 84	R14 98	R15 76	



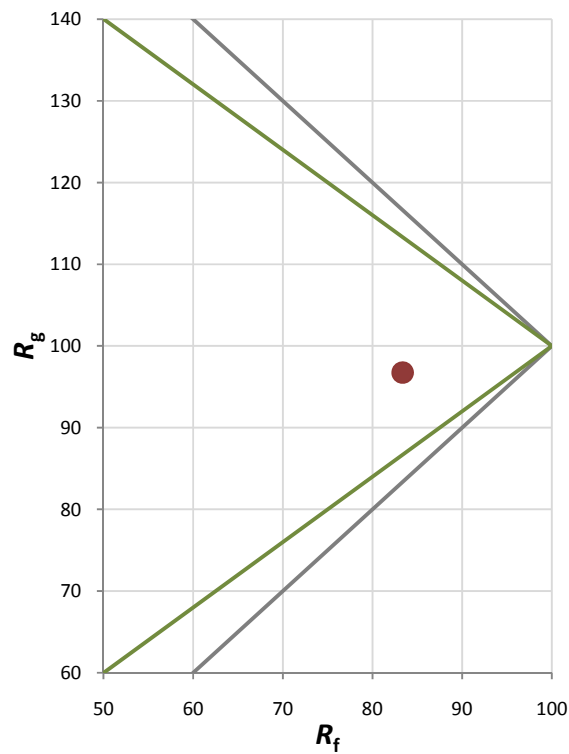
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	97

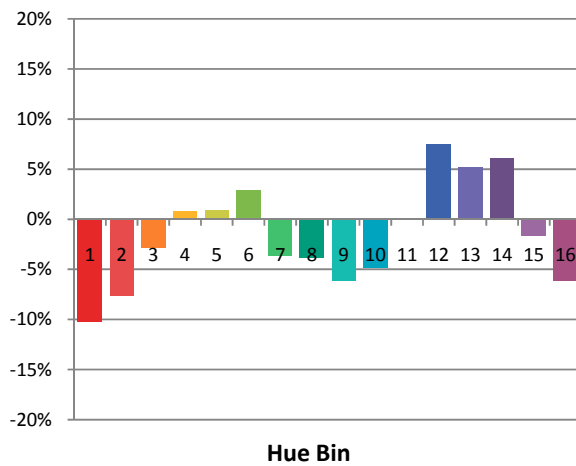
Spectral Power Distribution Comparison



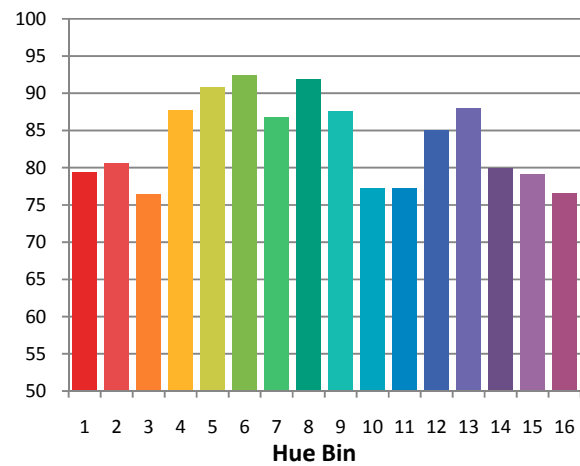
Plot of R_g versus R_f



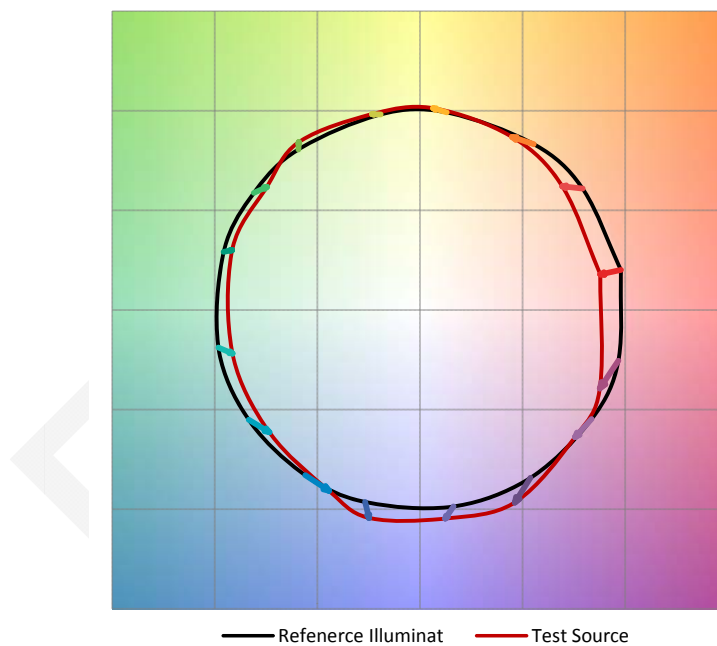
Chroma Shift by Hue



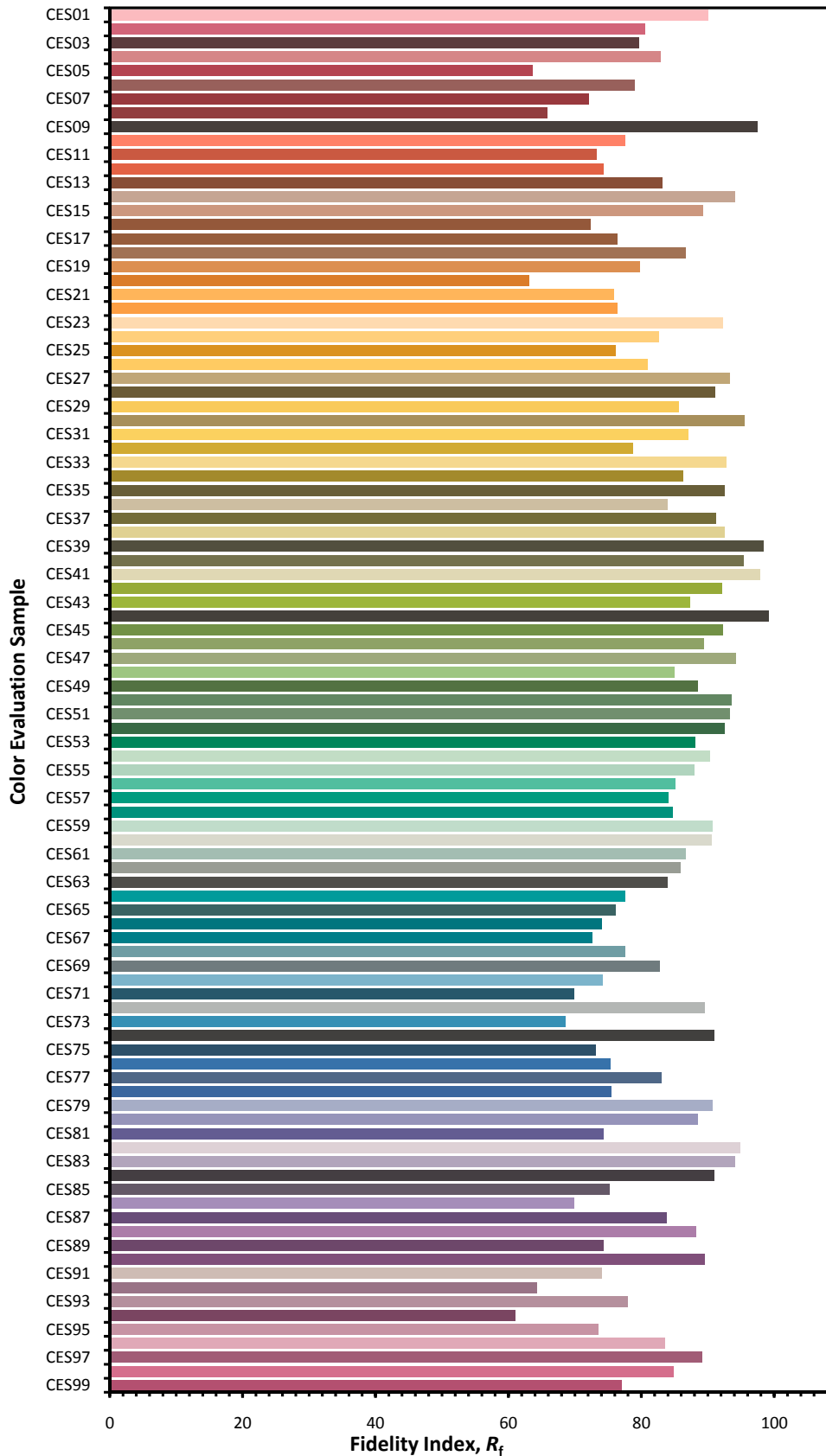
R_f by Hue



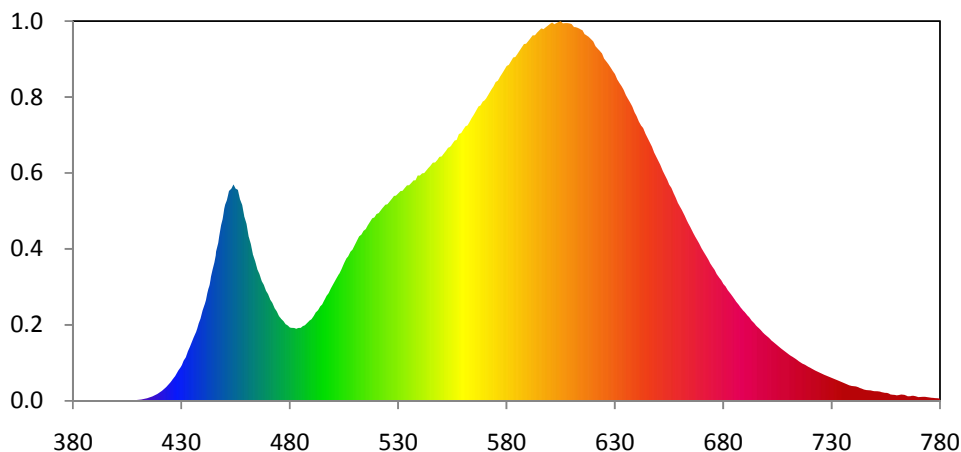
Color Vector Graphic



Color Fidelity by CES Sample



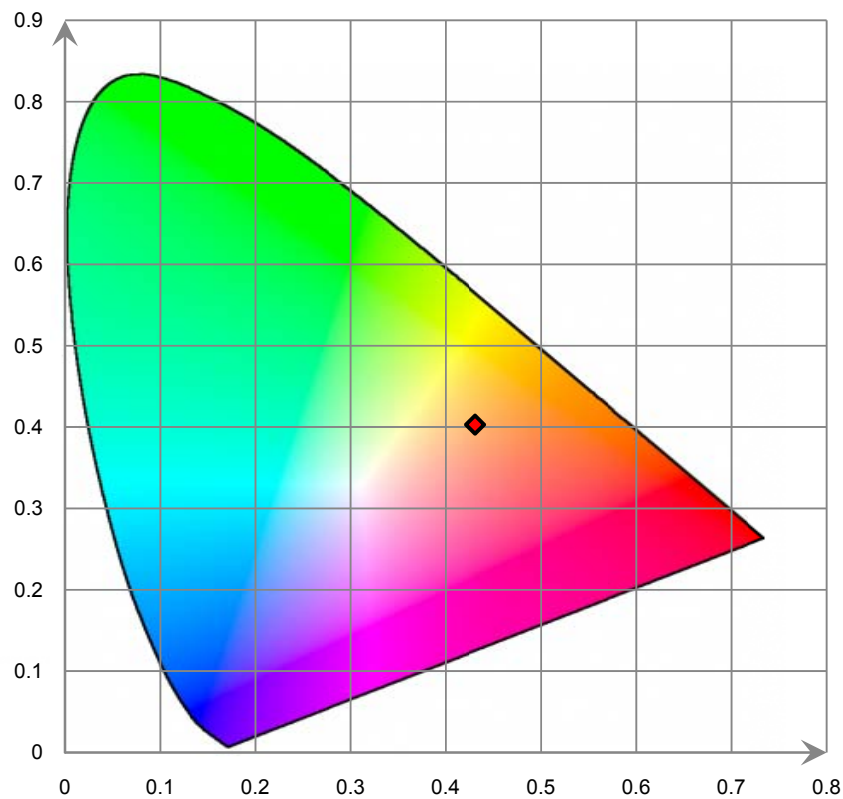
Relative Spectral Power Distribution



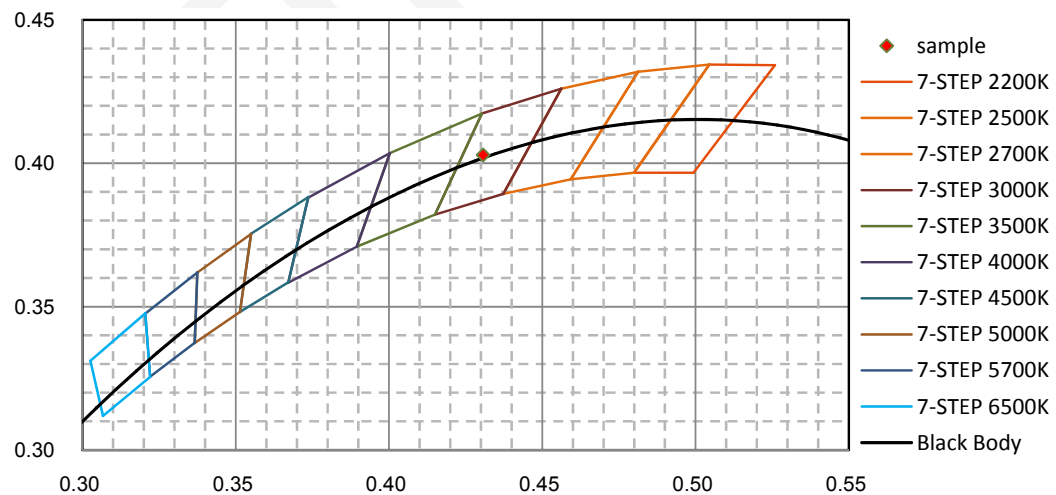
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.180E-02	421	1.020E+00	462	1.560E+01	503	1.270E+01	544	2.316E+01
381	2.560E-02	422	1.179E+00	463	1.454E+01	504	1.318E+01	545	2.341E+01
382	1.550E-02	423	1.426E+00	464	1.390E+01	505	1.366E+01	546	2.367E+01
383	2.440E-02	424	1.633E+00	465	1.307E+01	506	1.414E+01	547	2.369E+01
384	2.880E-02	425	1.844E+00	466	1.261E+01	507	1.439E+01	548	2.394E+01
385	2.480E-02	426	2.163E+00	467	1.191E+01	508	1.483E+01	549	2.424E+01
386	2.740E-02	427	2.431E+00	468	1.154E+01	509	1.506E+01	550	2.428E+01
387	3.110E-02	428	2.823E+00	469	1.094E+01	510	1.550E+01	551	2.456E+01
388	2.630E-02	429	3.143E+00	470	1.061E+01	511	1.593E+01	552	2.485E+01
389	2.310E-02	430	3.486E+00	471	1.005E+01	512	1.635E+01	553	2.516E+01
390	1.970E-02	431	3.983E+00	472	9.730E+00	513	1.653E+01	554	2.524E+01
391	1.130E-02	432	4.343E+00	473	9.211E+00	514	1.691E+01	555	2.555E+01
392	9.800E-03	433	4.926E+00	474	8.898E+00	515	1.708E+01	556	2.587E+01
393	1.170E-02	434	5.369E+00	475	8.434E+00	516	1.746E+01	557	2.593E+01
394	1.310E-02	435	6.011E+00	476	8.165E+00	517	1.780E+01	558	2.653E+01
395	1.510E-02	436	6.476E+00	477	7.942E+00	518	1.814E+01	559	2.662E+01
396	7.900E-03	437	6.963E+00	478	7.624E+00	519	1.824E+01	560	2.694E+01
397	6.300E-03	438	7.724E+00	479	7.507E+00	520	1.857E+01	561	2.728E+01
398	5.200E-03	439	8.278E+00	480	7.289E+00	521	1.866E+01	562	2.738E+01
399	4.900E-03	440	9.161E+00	481	7.254E+00	522	1.895E+01	563	2.776E+01
400	1.450E-02	441	9.783E+00	482	7.258E+00	523	1.921E+01	564	2.814E+01
401	1.850E-02	442	1.079E+01	483	7.166E+00	524	1.949E+01	565	2.849E+01
402	2.170E-02	443	1.155E+01	484	7.262E+00	525	1.954E+01	566	2.886E+01
403	2.290E-02	444	1.274E+01	485	7.254E+00	526	1.981E+01	567	2.925E+01
404	3.210E-02	445	1.358E+01	486	7.445E+00	527	2.007E+01	568	2.936E+01
405	4.290E-02	446	1.484E+01	487	7.518E+00	528	2.036E+01	569	2.975E+01
406	5.340E-02	447	1.573E+01	488	7.734E+00	529	2.040E+01	570	2.987E+01
407	5.860E-02	448	1.715E+01	489	7.984E+00	530	2.062E+01	571	3.021E+01
408	6.010E-02	449	1.806E+01	490	8.133E+00	531	2.085E+01	572	3.058E+01
409	9.700E-02	450	1.936E+01	491	8.449E+00	532	2.087E+01	573	3.093E+01
410	1.286E-01	451	1.996E+01	492	8.802E+00	533	2.115E+01	574	3.128E+01
411	1.516E-01	452	2.088E+01	493	9.008E+00	534	2.141E+01	575	3.169E+01
412	1.659E-01	453	2.107E+01	494	9.379E+00	535	2.141E+01	576	3.183E+01
413	2.075E-01	454	2.151E+01	495	9.611E+00	536	2.165E+01	577	3.222E+01
414	2.638E-01	455	2.109E+01	496	1.003E+01	537	2.190E+01	578	3.255E+01
415	3.162E-01	456	2.097E+01	497	1.046E+01	538	2.192E+01	579	3.289E+01
416	4.026E-01	457	2.005E+01	498	1.073E+01	539	2.242E+01	580	3.327E+01
417	4.794E-01	458	1.947E+01	499	1.118E+01	540	2.239E+01	581	3.336E+01
418	5.797E-01	459	1.834E+01	500	1.165E+01	541	2.261E+01	582	3.374E+01
419	7.144E-01	460	1.759E+01	501	1.194E+01	542	2.263E+01	583	3.412E+01
420	8.401E-01	461	1.636E+01	502	1.242E+01	543	2.291E+01	584	3.417E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.448E+01	626	3.372E+01	667	1.632E+01	708	4.995E+00	749	9.931E-01
586	3.480E+01	627	3.344E+01	668	1.595E+01	709	4.800E+00	750	9.624E-01
587	3.513E+01	628	3.312E+01	669	1.557E+01	710	4.650E+00	751	9.746E-01
588	3.546E+01	629	3.278E+01	670	1.514E+01	711	4.498E+00	752	9.446E-01
589	3.549E+01	630	3.246E+01	671	1.478E+01	712	4.378E+00	753	8.738E-01
590	3.575E+01	631	3.193E+01	672	1.442E+01	713	4.221E+00	754	8.196E-01
591	3.603E+01	632	3.161E+01	673	1.406E+01	714	4.073E+00	755	8.036E-01
592	3.631E+01	633	3.126E+01	674	1.364E+01	715	3.916E+00	756	7.738E-01
593	3.631E+01	634	3.090E+01	675	1.331E+01	716	3.768E+00	757	6.584E-01
594	3.656E+01	635	3.037E+01	676	1.300E+01	717	3.659E+00	758	6.143E-01
595	3.681E+01	636	3.002E+01	677	1.260E+01	718	3.546E+00	759	6.003E-01
596	3.702E+01	637	2.964E+01	678	1.228E+01	719	3.424E+00	760	5.549E-01
597	3.693E+01	638	2.925E+01	679	1.198E+01	720	3.313E+00	761	5.899E-01
598	3.712E+01	639	2.868E+01	680	1.162E+01	721	3.174E+00	762	6.384E-01
599	3.728E+01	640	2.830E+01	681	1.137E+01	722	3.079E+00	763	6.462E-01
600	3.746E+01	641	2.776E+01	682	1.102E+01	723	2.959E+00	764	5.532E-01
601	3.760E+01	642	2.736E+01	683	1.073E+01	724	2.855E+00	765	4.784E-01
602	3.743E+01	643	2.711E+01	684	1.046E+01	725	2.738E+00	766	4.631E-01
603	3.754E+01	644	2.656E+01	685	1.013E+01	726	2.615E+00	767	5.086E-01
604	3.765E+01	645	2.614E+01	686	9.832E+00	727	2.535E+00	768	5.014E-01
605	3.773E+01	646	2.572E+01	687	9.571E+00	728	2.463E+00	769	4.409E-01
606	3.751E+01	647	2.529E+01	688	9.281E+00	729	2.389E+00	770	3.837E-01
607	3.754E+01	648	2.471E+01	689	9.019E+00	730	2.287E+00	771	3.990E-01
608	3.755E+01	649	2.428E+01	690	8.774E+00	731	2.215E+00	772	4.163E-01
609	3.750E+01	650	2.386E+01	691	8.516E+00	732	2.110E+00	773	4.062E-01
610	3.745E+01	651	2.341E+01	692	8.284E+00	733	2.007E+00	774	3.782E-01
611	3.715E+01	652	2.287E+01	693	7.991E+00	734	1.932E+00	775	3.543E-01
612	3.712E+01	653	2.245E+01	694	7.770E+00	735	1.834E+00	776	3.237E-01
613	3.705E+01	654	2.202E+01	695	7.515E+00	736	1.768E+00	777	2.978E-01
614	3.693E+01	655	2.148E+01	696	7.301E+00	737	1.658E+00	778	2.731E-01
615	3.682E+01	656	2.118E+01	697	7.111E+00	738	1.559E+00	779	2.716E-01
616	3.643E+01	657	2.065E+01	698	6.857E+00	739	1.498E+00	780	2.203E-01
617	3.629E+01	658	2.021E+01	699	6.642E+00	740	1.481E+00		
618	3.615E+01	659	1.967E+01	700	6.449E+00	741	1.453E+00		
619	3.593E+01	660	1.929E+01	701	6.269E+00	742	1.382E+00		
620	3.570E+01	661	1.890E+01	702	6.042E+00	743	1.287E+00		
621	3.525E+01	662	1.849E+01	703	5.853E+00	744	1.208E+00		
622	3.500E+01	663	1.800E+01	704	5.653E+00	745	1.137E+00		
623	3.477E+01	664	1.758E+01	705	5.484E+00	746	1.081E+00		
624	3.452E+01	665	1.717E+01	706	5.334E+00	747	1.069E+00		
625	3.401E+01	666	1.670E+01	707	5.166E+00	748	1.050E+00		

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**

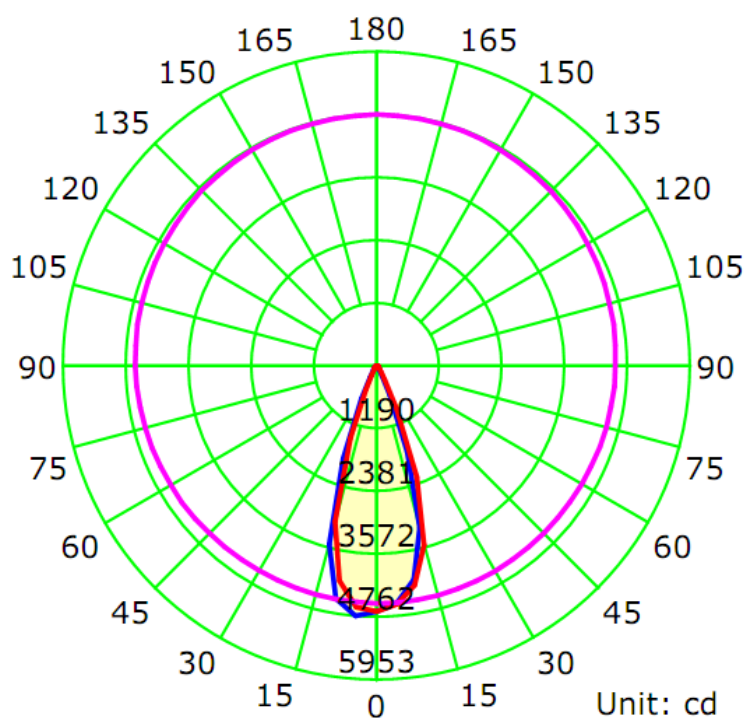
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1580	18.94	0.9970

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1928.3	101.81	4762.8	0.62	0.62

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	36.2	36.6	37.0	36.7	36.6
Field Angle (10% I_{max}):	54.3	54.5	54.4	54.1	54.3

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	4657	4657	4657	4657	4657	4657	4657	4657
5.0°	4510	4502	4485	4508	4541	4607	4686	4745
10.0°	4115	4139	4125	4160	4219	4321	4394	4489
15.0°	3176	3281	3344	3446	3520	3589	3640	3649
20.0°	1740	1884	2026	2146	2252	2285	2266	2187
25.0°	612	692	768	826	888	917	902	854
30.0°	216	236	260	287	310	318	320	309
35.0°	113	116	125	135	146	155	158	152
40.0°	84	84	84	87	90	91	91	91
45.0°	72	71	70	70	72	73	75	76
50.0°	62	61	61	61	62	63	64	65
55.0°	51	51	51	51	52	53	53	54
60.0°	41	41	41	42	42	43	43	43
65.0°	30	31	31	32	32	32	32	32
70.0°	22	22	22	23	23	24	23	23
75.0°	15	15	16	16	16	16	16	16
80.0°	9	10	10	10	11	11	10	10
85.0°	5	5	5	6	6	6	5	5
90.0°	1	2	2	2	2	2	2	2
95.0°	1	1	1	1	1	1	1	1
100.0°	1	1	1	1	1	1	1	1
105.0°	1	1	1	1	1	1	1	1
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°	4657	4657	4657	4657	4657	4657	4657	4657
5.0°	4763	4751	4700	4641	4589	4533	4500	4477
10.0°	4481	4413	4316	4218	4135	4063	4004	4000
15.0°	3503	3394	3294	3186	3062	3008	2960	2990
20.0°	1872	1743	1644	1537	1470	1446	1436	1508
25.0°	702	639	575	539	509	486	493	507
30.0°	270	253	235	222	211	196	192	191
35.0°	130	124	119	113	110	107	104	104
40.0°	88	87	84	82	82	82	81	82
45.0°	75	73	70	69	70	70	71	71
50.0°	64	62	60	59	59	60	60	60
55.0°	53	51	50	48	48	49	49	50
60.0°	41	40	38	38	38	38	38	39
65.0°	27	29	28	27	21	25	28	22
70.0°	21	20	20	19	19	19	20	20
75.0°	15	14	13	13	13	13	14	14
80.0°	9	8	8	8	7	8	8	9
85.0°	4	4	4	3	3	3	4	4
90.0°	1	1	1	1	1	1	1	1
95.0°	1	1	1	1	1	1	1	1
100.0°	1	1	1	1	1	1	1	1
105.0°	1	1	1	1	1	1	1	1
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

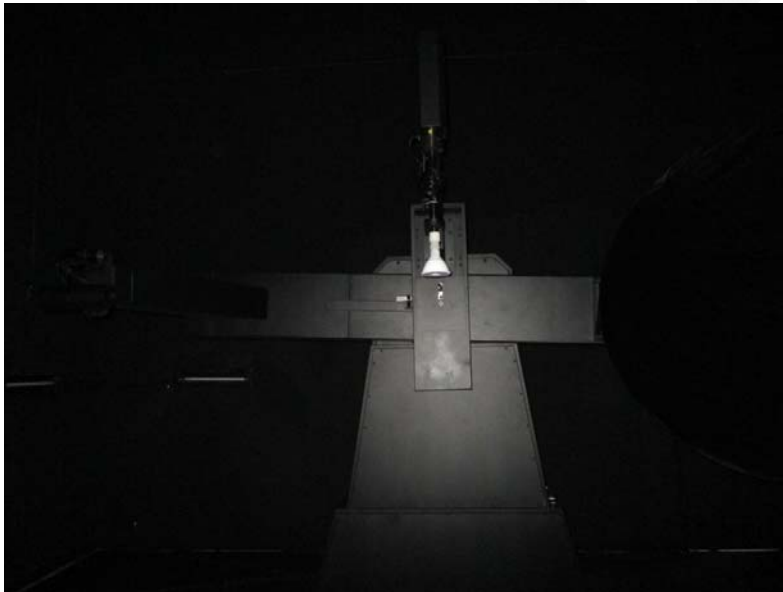
Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	110.6	5.74	0-5	110.6	5.74
5-10	315.5	16.36	0-10	426.1	22.10
10-15	447.2	23.19	0-15	873.4	45.29
15-20	424.9	22.03	0-20	1298.2	67.32
20-25	264.5	13.72	0-25	1562.7	81.04
25-30	118.1	6.13	0-30	1680.9	87.17
30-35	55.6	2.88	0-35	1736.4	90.05
35-40	35.2	1.83	0-40	1771.6	91.87
40-45	29.1	1.51	0-45	1800.8	93.38
45-50	26.9	1.40	0-50	1827.7	94.78
50-55	24.4	1.27	0-55	1852.1	96.05
55-60	21.1	1.09	0-60	1873.1	97.14
60-65	16.8	0.87	0-65	1889.9	98.01
65-70	12.7	0.66	0-70	1902.6	98.66
70-75	9.4	0.49	0-75	1911.9	99.15
75-80	6.3	0.33	0-80	1918.3	99.48
80-85	3.7	0.19	0-85	1921.9	99.67
85-90	1.6	0.08	0-90	1923.5	99.75
90-95	0.6	0.03	0-95	1924.1	99.78
95-100	0.4	0.02	0-100	1924.5	99.80
100-105	0.4	0.02	0-105	1924.8	99.82
105-110	0.4	0.02	0-110	1925.2	99.84
110-115	0.4	0.02	0-115	1925.6	99.86
115-120	0.3	0.02	0-120	1925.9	99.87
120-125	0.3	0.02	0-125	1926.2	99.89
125-130	0.3	0.02	0-130	1926.6	99.91
130-135	0.3	0.02	0-135	1926.9	99.92
135-140	0.3	0.01	0-140	1927.1	99.94
140-145	0.3	0.01	0-145	1927.4	99.95
145-150	0.2	0.01	0-150	1927.6	99.96
150-155	0.2	0.01	0-155	1927.8	99.97
155-160	0.2	0.01	0-160	1928.0	99.98
160-165	0.1	0.01	0-165	1928.1	99.99
165-170	0.1	0.01	0-170	1928.3	100.00
170-175	0.1	0.00	0-175	1928.3	100.00
175-180	0.0	0.00	0-180	1928.3	100.00

6. Product Photo



7. Product Test orientation in the Goniophotometer



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