



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 10.5PLH/930/DIR

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Carl Du <i>Carl Du</i>
Report Number:	RKS161013004-10
Test Date:	2016-10-17
Report Date:	2016-10-18
Reviewed By:	Blake Zhang <i>Blake Zhang</i>
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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:

Two samples were received on 2016-10-13 and used for testing with ballast, and only sample #1 was used for Photometric testing.

Model Tested: 10.5PLH/930/DIR
 Manufacturer: GREEN CREATIVE LTD
 Brand Name: GREEN CREATIVE
 Product Designation: Integral LED Lamp
 Burning Time Before Test: 0hour(For New Products)
 Ballast: ICF-2S26-H1-LD

Rated Values:

Rated Voltage/Frequency: 120 VAC 60Hz
 Rated Power: 10.5W
 Nominal CCT: 3000K
 Nominal Lumen Output: 890 lm
 Nominal CRI: 90

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	SPR-600	S09008	25~50°C	2016-03-10	2017-03-09
Spectral photometer	SENSING	SPR3000	90902027	350nm~800nm	2016-03-10	2017-03-09
Power Meter	YOKOGAWA	WT-210	91j926132	15/30/60/150/300/600 V	2016-03-04	2017-03-03
AC Power Supply	ALL Power	APW-105N	970663	220V±10% 50HZ	2016-03-04	2017-03-03
Standard Light Source	EVERFINE	D204	01331191	24V/100W	2016-08-27	2017-08-26
Thermal Meter	SENSING	N/A	N/A	25、50°C	2016-03-10	2017-03-09
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	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	15/30/60/150/300/600 V	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	EVERFINE	D908	1012003	N/A	2016-09-08	2017-09-07

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

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 $U=2.1\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=32\text{K}$ ($K=2$), 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 $U=0.15\%$ 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_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**

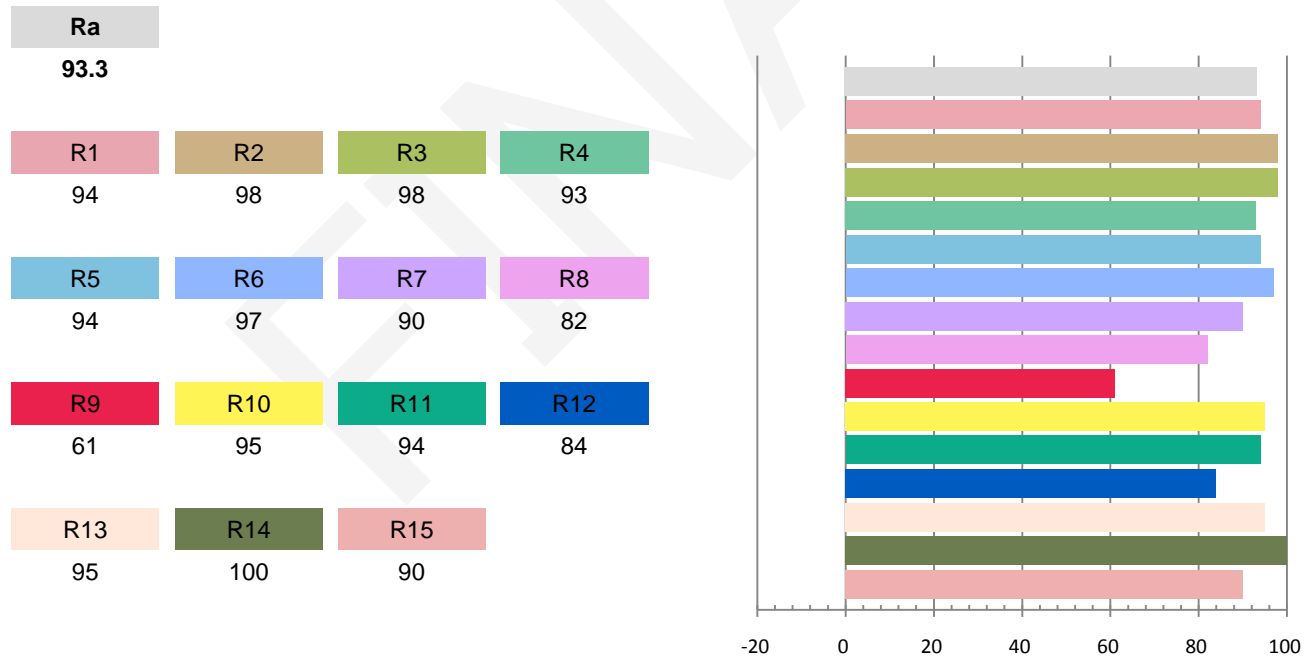
Test orientation: **Downward**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.1	60	0.102	12.23	0.9986	949.6	77.65

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
3.278	3096	-0.00055	0.4295	0.4000	0.2475	0.5187

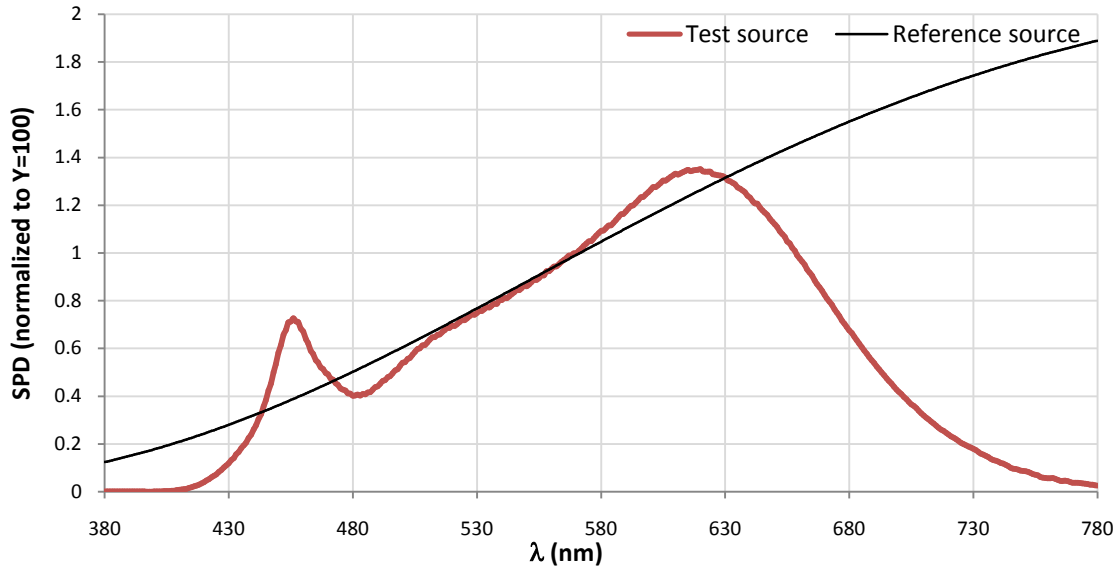
Color Rendering Index



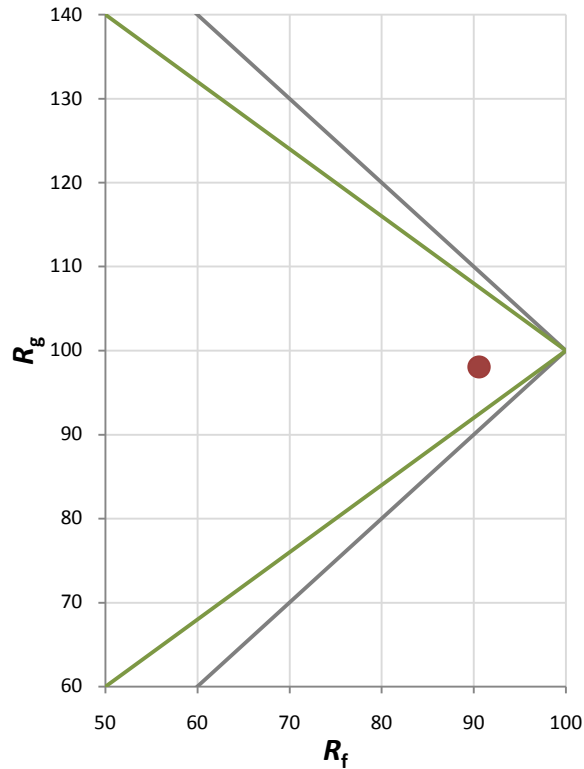
Fidelity Index and Gamut Index

Fidelity Index R_f	91
Gamut Index R_g	98

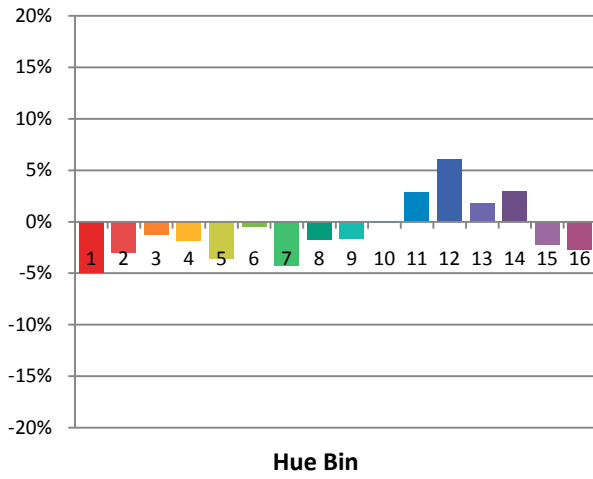
Spectral Power Distribution Comparison



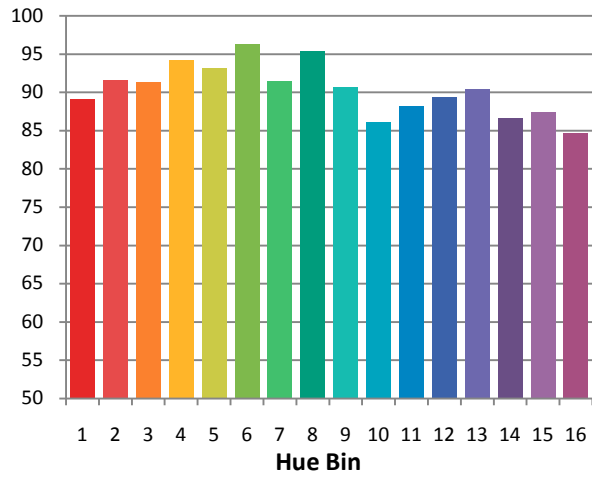
Plot of R_g versus R_f



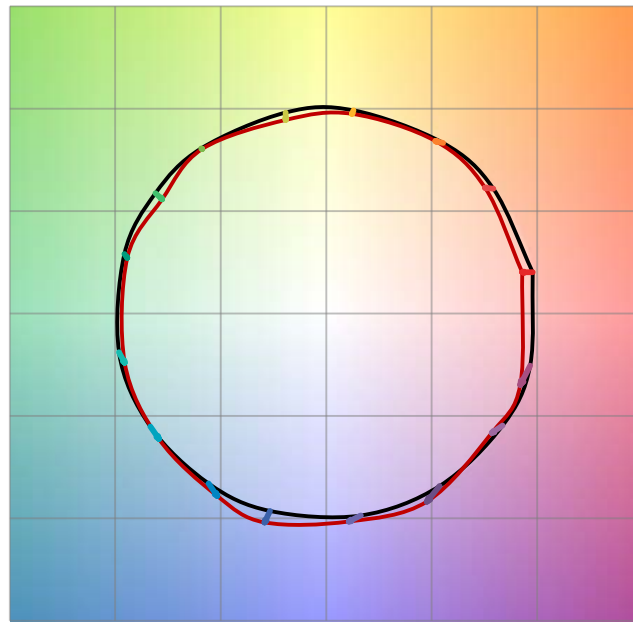
Chroma Shift by Hue



R_f by Hue

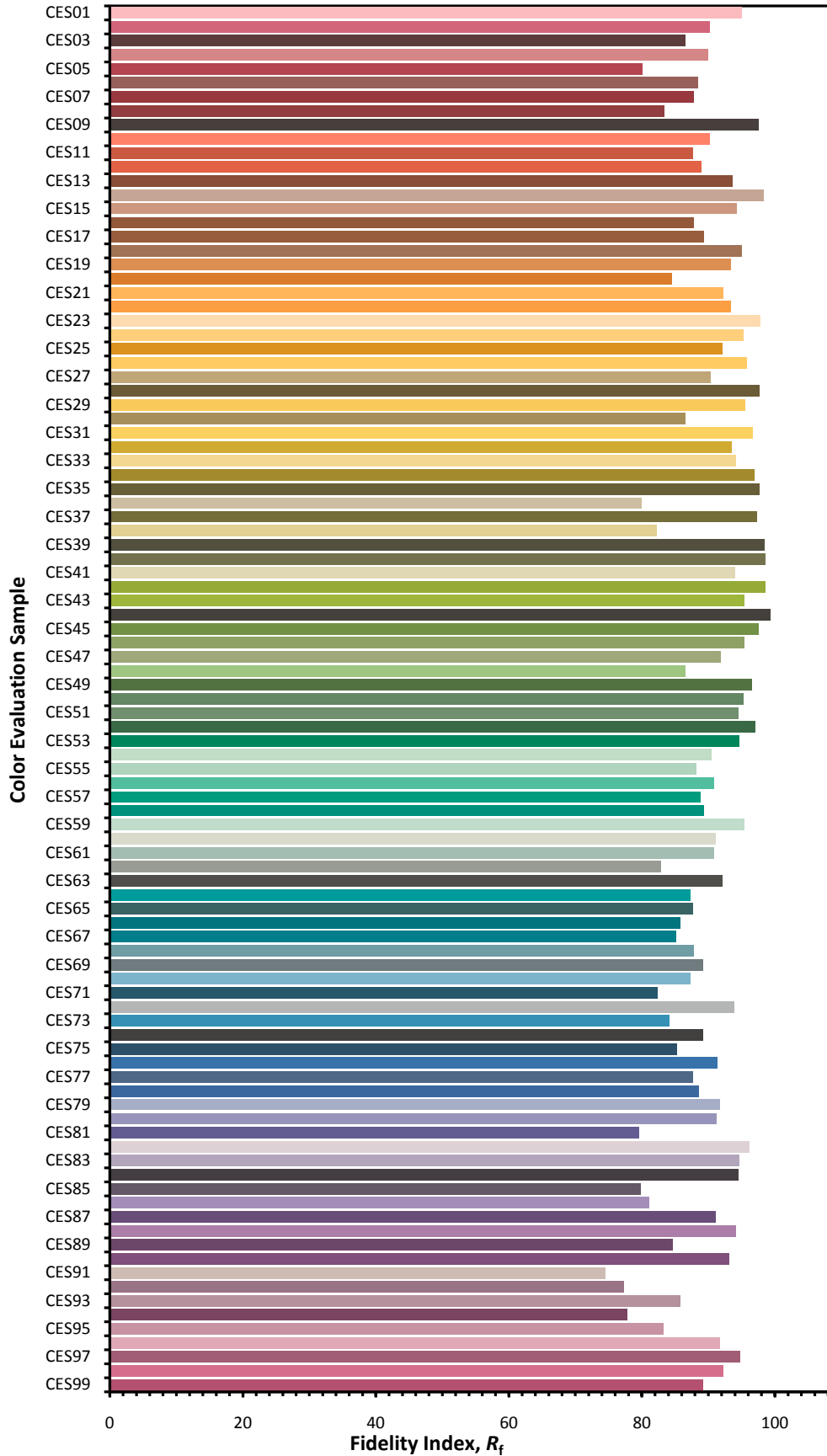


Color Vector Graphic

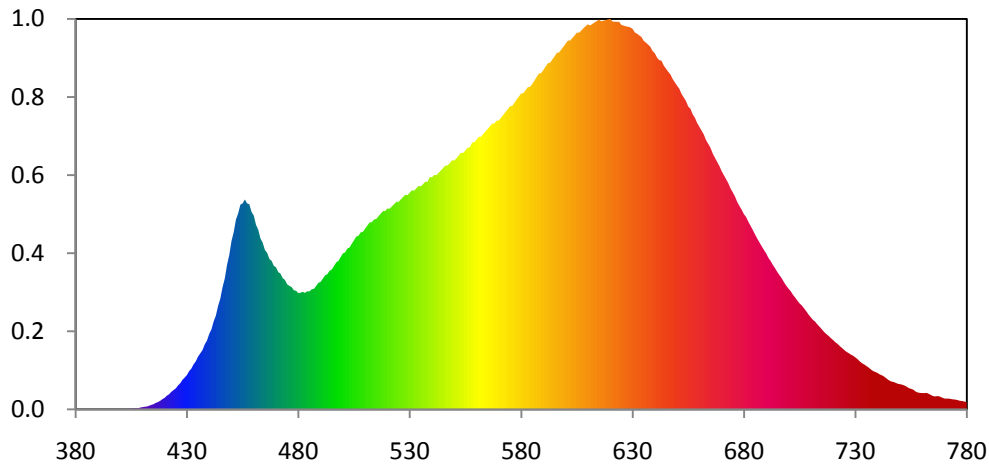


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



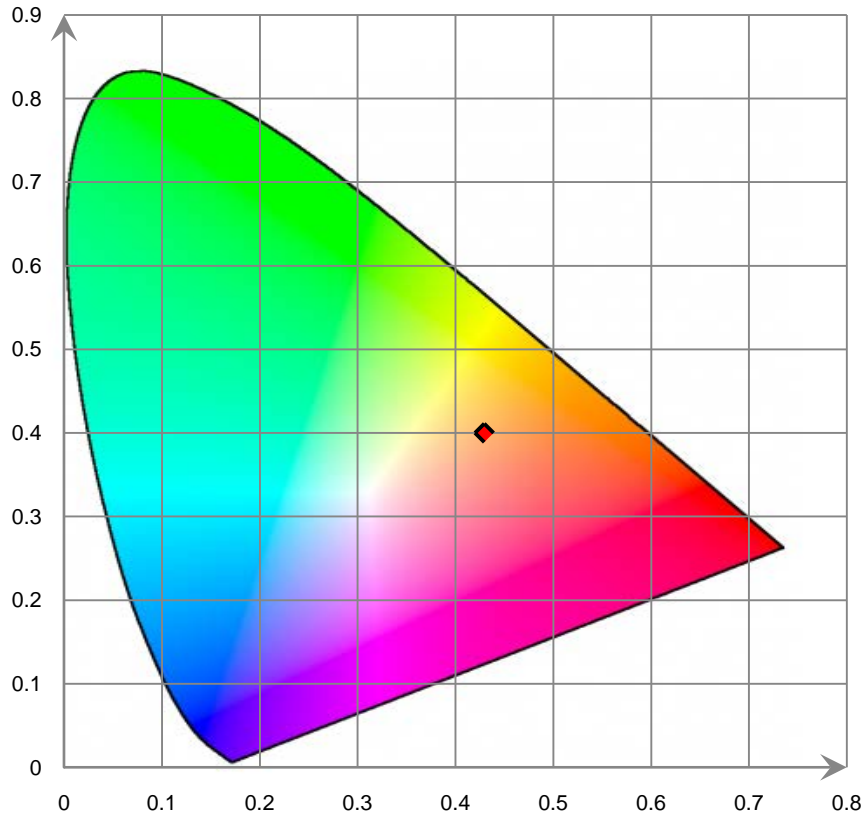
Relative Spectral Power Distribution



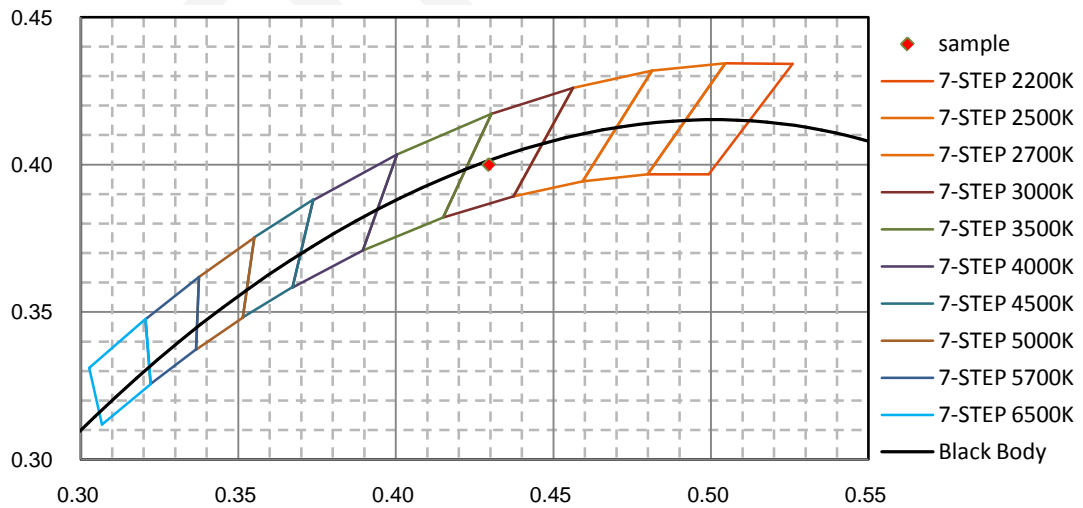
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.410E-02	421	7.203E-01	462	9.447E+00	503	8.509E+00	544	1.256E+01
381	2.130E-02	422	7.981E-01	463	8.980E+00	504	8.705E+00	545	1.268E+01
382	1.890E-02	423	9.207E-01	464	8.761E+00	505	8.891E+00	546	1.282E+01
383	2.230E-02	424	1.015E+00	465	8.376E+00	506	9.080E+00	547	1.282E+01
384	1.830E-02	425	1.104E+00	466	8.225E+00	507	9.127E+00	548	1.295E+01
385	1.200E-02	426	1.258E+00	467	7.910E+00	508	9.301E+00	549	1.309E+01
386	1.210E-02	427	1.375E+00	468	7.805E+00	509	9.334E+00	550	1.308E+01
387	1.620E-02	428	1.553E+00	469	7.545E+00	510	9.500E+00	551	1.320E+01
388	1.910E-02	429	1.672E+00	470	7.467E+00	511	9.664E+00	552	1.334E+01
389	2.360E-02	430	1.806E+00	471	7.215E+00	512	9.822E+00	553	1.348E+01
390	2.040E-02	431	2.010E+00	472	7.134E+00	513	9.838E+00	554	1.348E+01
391	1.300E-02	432	2.145E+00	473	6.897E+00	514	9.982E+00	555	1.361E+01
392	1.010E-02	433	2.372E+00	474	6.802E+00	515	1.001E+01	556	1.376E+01
393	1.150E-02	434	2.525E+00	475	6.570E+00	516	1.015E+01	557	1.376E+01
394	1.310E-02	435	2.776E+00	476	6.492E+00	517	1.029E+01	558	1.403E+01
395	1.430E-02	436	2.945E+00	477	6.428E+00	518	1.042E+01	559	1.403E+01
396	9.900E-03	437	3.119E+00	478	6.257E+00	519	1.043E+01	560	1.417E+01
397	5.700E-03	438	3.418E+00	479	6.236E+00	520	1.056E+01	561	1.432E+01
398	4.000E-03	439	3.616E+00	480	6.108E+00	521	1.054E+01	562	1.433E+01
399	2.000E-03	440	3.964E+00	481	6.130E+00	522	1.067E+01	563	1.447E+01
400	1.320E-02	441	4.205E+00	482	6.178E+00	523	1.079E+01	564	1.461E+01
401	1.980E-02	442	4.622E+00	483	6.122E+00	524	1.091E+01	565	1.474E+01
402	2.260E-02	443	4.931E+00	484	6.210E+00	525	1.091E+01	566	1.487E+01
403	2.580E-02	444	5.444E+00	485	6.197E+00	526	1.104E+01	567	1.502E+01
404	3.100E-02	445	5.829E+00	486	6.314E+00	527	1.116E+01	568	1.503E+01
405	4.490E-02	446	6.426E+00	487	6.333E+00	528	1.127E+01	569	1.517E+01
406	4.680E-02	447	6.883E+00	488	6.491E+00	529	1.126E+01	570	1.518E+01
407	5.300E-02	448	7.597E+00	489	6.650E+00	530	1.139E+01	571	1.533E+01
408	6.050E-02	449	8.111E+00	490	6.699E+00	531	1.151E+01	572	1.548E+01
409	9.360E-02	450	8.845E+00	491	6.869E+00	532	1.150E+01	573	1.563E+01
410	1.175E-01	451	9.314E+00	492	7.043E+00	533	1.162E+01	574	1.577E+01
411	1.366E-01	452	9.976E+00	493	7.102E+00	534	1.174E+01	575	1.593E+01
412	1.517E-01	453	1.030E+01	494	7.286E+00	535	1.172E+01	576	1.595E+01
413	1.888E-01	454	1.076E+01	495	7.352E+00	536	1.184E+01	577	1.611E+01
414	2.360E-01	455	1.082E+01	496	7.530E+00	537	1.197E+01	578	1.629E+01
415	2.736E-01	456	1.103E+01	497	7.722E+00	538	1.196E+01	579	1.644E+01
416	3.400E-01	457	1.083E+01	498	7.801E+00	539	1.221E+01	580	1.660E+01
417	3.858E-01	458	1.078E+01	499	8.004E+00	540	1.219E+01	581	1.662E+01
418	4.500E-01	459	1.037E+01	500	8.195E+00	541	1.232E+01	582	1.677E+01
419	5.373E-01	460	1.019E+01	501	8.250E+00	542	1.231E+01	583	1.694E+01
420	6.091E-01	461	9.701E+00	502	8.454E+00	543	1.244E+01	584	1.695E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.710E+01	626	2.017E+01	667	1.322E+01	708	5.153E+00	749	1.347E+00
586	1.729E+01	627	2.013E+01	668	1.300E+01	709	4.983E+00	750	1.326E+00
587	1.747E+01	628	2.011E+01	669	1.279E+01	710	4.842E+00	751	1.300E+00
588	1.765E+01	629	2.007E+01	670	1.252E+01	711	4.703E+00	752	1.259E+00
589	1.768E+01	630	2.000E+01	671	1.231E+01	712	4.607E+00	753	1.195E+00
590	1.784E+01	631	1.981E+01	672	1.210E+01	713	4.461E+00	754	1.120E+00
591	1.802E+01	632	1.974E+01	673	1.188E+01	714	4.338E+00	755	1.078E+00
592	1.819E+01	633	1.965E+01	674	1.161E+01	715	4.202E+00	756	1.039E+00
593	1.822E+01	634	1.957E+01	675	1.141E+01	716	4.069E+00	757	9.420E-01
594	1.839E+01	635	1.937E+01	676	1.119E+01	717	3.958E+00	758	8.882E-01
595	1.855E+01	636	1.927E+01	677	1.090E+01	718	3.862E+00	759	8.657E-01
596	1.873E+01	637	1.917E+01	678	1.068E+01	719	3.746E+00	760	8.581E-01
597	1.876E+01	638	1.905E+01	679	1.049E+01	720	3.647E+00	761	8.552E-01
598	1.891E+01	639	1.883E+01	680	1.026E+01	721	3.531E+00	762	8.667E-01
599	1.906E+01	640	1.872E+01	681	1.011E+01	722	3.445E+00	763	8.161E-01
600	1.922E+01	641	1.848E+01	682	9.854E+00	723	3.330E+00	764	7.514E-01
601	1.938E+01	642	1.835E+01	683	9.646E+00	724	3.227E+00	765	6.944E-01
602	1.938E+01	643	1.832E+01	684	9.424E+00	725	3.122E+00	766	6.811E-01
603	1.951E+01	644	1.807E+01	685	9.193E+00	726	3.027E+00	767	7.011E-01
604	1.965E+01	645	1.790E+01	686	8.969E+00	727	2.958E+00	768	6.701E-01
605	1.980E+01	646	1.774E+01	687	8.768E+00	728	2.879E+00	769	6.139E-01
606	1.980E+01	647	1.761E+01	688	8.569E+00	729	2.819E+00	770	5.708E-01
607	1.991E+01	648	1.736E+01	689	8.376E+00	730	2.734E+00	771	5.650E-01
608	2.004E+01	649	1.719E+01	690	8.194E+00	731	2.640E+00	772	5.671E-01
609	2.014E+01	650	1.701E+01	691	7.961E+00	732	2.522E+00	773	5.408E-01
610	2.023E+01	651	1.685E+01	692	7.794E+00	733	2.425E+00	774	5.256E-01
611	2.018E+01	652	1.658E+01	693	7.590E+00	734	2.361E+00	775	5.138E-01
612	2.026E+01	653	1.639E+01	694	7.413E+00	735	2.275E+00	776	4.839E-01
613	2.034E+01	654	1.620E+01	695	7.216E+00	736	2.198E+00	777	4.491E-01
614	2.041E+01	655	1.591E+01	696	7.050E+00	737	2.097E+00	778	4.369E-01
615	2.048E+01	656	1.580E+01	697	6.885E+00	738	2.016E+00	779	4.098E-01
616	2.039E+01	657	1.551E+01	698	6.679E+00	739	1.966E+00	780	3.792E-01
617	2.043E+01	658	1.532E+01	699	6.501E+00	740	1.913E+00		
618	2.046E+01	659	1.505E+01	700	6.347E+00	741	1.834E+00		
619	2.049E+01	660	1.485E+01	701	6.208E+00	742	1.786E+00		
620	2.052E+01	661	1.465E+01	702	6.025E+00	743	1.717E+00		
621	2.038E+01	662	1.444E+01	703	5.878E+00	744	1.626E+00		
622	2.037E+01	663	1.415E+01	704	5.714E+00	745	1.535E+00		
623	2.037E+01	664	1.395E+01	705	5.565E+00	746	1.472E+00		
624	2.036E+01	665	1.375E+01	706	5.459E+00	747	1.445E+00		
625	2.020E+01	666	1.345E+01	707	5.308E+00	748	1.403E+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**

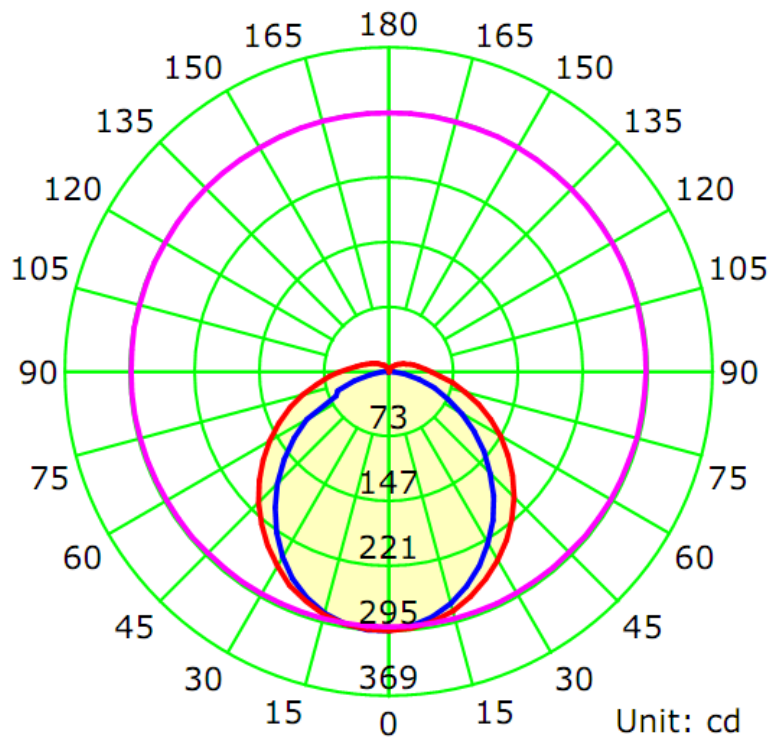
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1017	12.19	0.9980

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
954.1	78.27	295.3	1.19	1.27

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	100.4	111.4	122.6	111.0	111.4
Field Angle (10% I _{max}):	155.1	188.5	213.4	188.2	186.3

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	295	295	295	295	295	295	295	295
5.0°	291	291	291	292	293	294	294	295
10.0°	284	284	285	287	289	290	291	292
15.0°	273	274	276	279	282	284	285	285
20.0°	260	261	265	269	273	275	275	275
25.0°	244	246	251	256	261	263	263	262
30.0°	227	228	235	242	248	250	248	246
35.0°	207	210	217	227	234	235	231	227
40.0°	186	189	199	210	219	219	213	207
45.0°	164	168	180	193	202	202	194	185
50.0°	141	146	160	175	184	184	174	162
55.0°	119	125	141	157	166	165	153	139
60.0°	97	104	122	138	147	146	132	116
65.0°	75	84	103	119	128	126	113	94
70.0°	55	65	85	101	109	107	93	73
75.0°	36	48	68	83	90	88	75	54
80.0°	19	33	53	67	73	72	59	38
85.0°	6	20	41	54	60	58	46	25
90.0°	0	13	32	44	49	47	36	17
95.0°	0	8	26	36	41	39	29	12
100.0°	0	6	21	31	35	33	24	9
105.0°	0	5	18	27	30	28	20	7
110.0°	0	4	15	23	26	24	16	5
115.0°	1	3	13	20	22	20	13	4
120.0°	1	3	11	17	19	17	11	4
125.0°	1	2	9	14	16	15	9	3
130.0°	1	3	8	12	14	12	8	3
135.0°	1	3	7	10	12	10	7	2
140.0°	1	2	6	9	10	9	5	2
145.0°	1	2	4	7	8	7	4	2
150.0°	1	2	4	6	6	5	3	1
155.0°	1	2	3	4	5	4	3	1
160.0°	1	1	2	3	3	3	2	1
165.0°	1	1	2	2	2	2	1	0
170.0°	1	1	1	1	1	1	1	0
175.0°	1	1	1	1	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

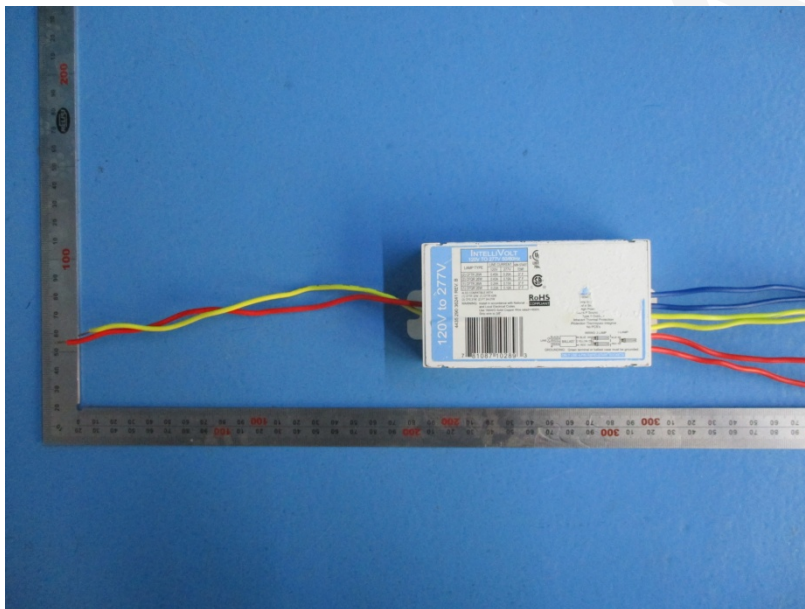
C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	295	295	295	295	295	295	295	295
5.0°	295	295	295	295	294	294	292	291
10.0°	292	292	293	293	292	290	287	284
15.0°	284	286	288	288	287	283	279	275
20.0°	274	276	279	280	279	274	268	262
25.0°	260	263	268	270	268	262	255	247
30.0°	243	248	253	257	256	249	239	230
35.0°	224	229	237	243	242	234	222	211
40.0°	203	209	219	227	227	217	204	191
45.0°	180	188	200	210	211	200	185	170
50.0°	156	165	180	192	193	182	165	148
55.0°	132	143	160	173	175	164	146	126
60.0°	109	120	140	155	157	146	127	106
65.0°	67	99	118	136	139	128	109	86
70.0°	63	79	102	117	120	110	91	67
75.0°	42	59	83	99	102	93	74	50
80.0°	23	42	66	82	84	76	59	35
85.0°	8	28	52	66	69	62	46	23
90.0°	1	18	40	53	56	50	35	15
95.0°	0	12	31	44	46	41	28	10
100.0°	0	9	25	36	38	33	22	7
105.0°	0	7	20	30	32	28	18	6
110.0°	0	5	17	25	27	24	15	5
115.0°	0	5	14	21	23	20	13	4
120.0°	0	4	12	18	20	17	11	4
125.0°	0	4	10	15	17	14	9	4
130.0°	0	3	9	13	14	12	8	3
135.0°	0	3	7	11	12	11	7	3
140.0°	0	2	6	9	10	9	6	3
145.0°	0	2	5	8	9	8	6	2
150.0°	0	2	4	6	7	6	5	2
155.0°	0	1	3	5	6	5	4	2
160.0°	0	1	2	4	4	4	2	1
165.0°	0	0	1	2	2	2	1	1
170.0°	0	0	1	1	1	1	1	1
175.0°	0	0	0	0	0	0	1	1
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

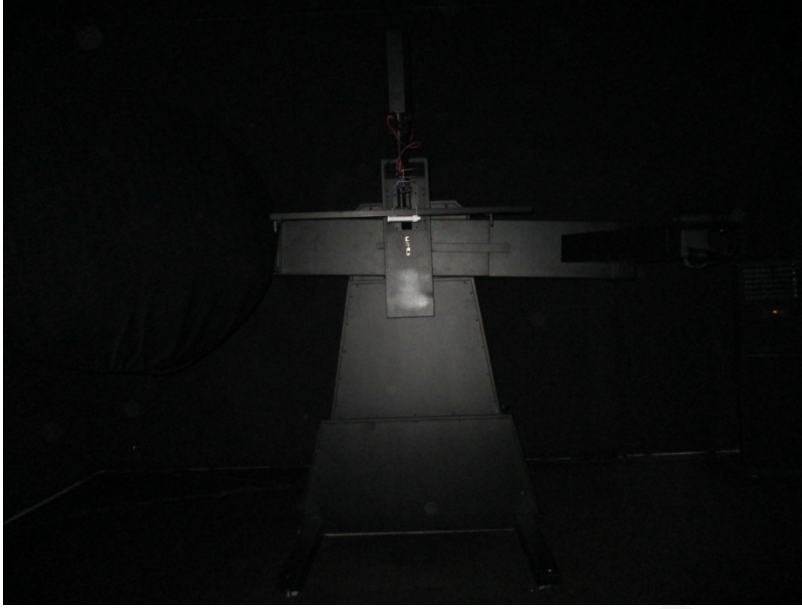
Deg	Flux (lm)	%
0-5	7.0	0.74
5-10	20.8	2.18
10-15	33.9	3.55
15-20	45.6	4.78
20-25	55.6	5.83
25-30	63.6	6.66
30-35	69.3	7.26
35-40	72.6	7.61
40-45	73.7	7.72
45-50	72.5	7.59
50-55	69.2	7.25
55-60	64.3	6.73
60-65	57.5	6.03
65-70	50.0	5.24
70-75	42.1	4.42
75-80	33.9	3.55
80-85	26.2	2.74
85-90	19.9	2.09
90-95	15.5	1.63
95-100	12.4	1.30
100-105	10.1	1.06
105-110	8.3	0.86
110-115	6.7	0.71
115-120	5.5	0.58
120-125	4.5	0.47
125-130	3.6	0.38
130-135	2.9	0.30
135-140	2.3	0.24
140-145	1.7	0.18
145-150	1.2	0.13
150-155	0.9	0.09
155-160	0.5	0.06
160-165	0.3	0.03
165-170	0.1	0.01
170-175	0.0	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	7.0	0.74
0-10	27.9	2.92
0-15	61.7	6.47
0-20	107.3	11.25
0-25	162.9	17.07
0-30	226.5	23.74
0-35	295.7	31.00
0-40	368.4	38.61
0-45	442.1	46.33
0-50	514.5	53.93
0-55	583.7	61.18
0-60	648.0	67.92
0-65	705.5	73.95
0-70	755.5	79.19
0-75	797.7	83.60
0-80	831.5	87.15
0-85	857.7	89.90
0-90	877.6	91.99
0-95	893.1	93.61
0-100	905.6	94.92
0-105	915.7	95.97
0-110	923.9	96.84
0-115	930.6	97.54
0-120	936.1	98.12
0-125	940.6	98.59
0-130	944.2	98.96
0-135	947.0	99.26
0-140	949.3	99.50
0-145	951.0	99.68
0-150	952.2	99.81
0-155	953.1	99.90
0-160	953.6	99.95
0-165	953.9	99.98
0-170	954.0	100.00
0-175	954.1	100.00
0-180	954.1	100.00

6. Product Photo



7. Product Test orientation in the Goniophotometer



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