IES LM-79-19

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

Test Model: 15A19DIM/830

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution
Reviewed By:	George Chen
Report Number:	KS2211206-62747E-10
Test Date:	2021-12-16
Report Date:	2021-12-28
Approved by:	Blake Zhang / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588

1. Product Description

General Information:

One test sample was in good condition and received on 2021-12-06, and used for testing.

Model Tested:	15A19DIM/830
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 V AC 60Hz
Rated Power:	15W
Nominal CCT:	3000K
Nominal Lumen Output:	1650 lm

2. Standards Used

- ANSI/IES LM-79-19: Approved method :Optical and Electrical Measurements of Solid-State Lighting Products
- ANSI C82.77-10-2014: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-18: 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	Calibration date	Calibration due date
1.5m integrating sphere	SENSING	1.5m	NA	2021-06-30	2022-06-29
Digital power meter	EVERFINE	PF9811	G135717CN1361159	2021-09-23	2022-09-22
High-precision rapid spectral radiometer	EVERFINE	HAAS-2000	N/A	2021-06-30	2022-06-29
Precision frequency power supply	ALL Power	APW-105N	970663	2021-01-04	2022-01-03
Standard Light Source	EVERFINE	D204	N/A	2021-10-15	2022-10-14
thermometer	SENSING	NA	NA	2021-04-27	2022-04-26
Programmable Precision DC Power Supply	EVERFINE	WY5015	11060010	2021-06-30	2022-06-29
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	2021-01-04	2022-01-03
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	2021-01-04	2022-01-03
Digital power meter	YOKOGAWA	WT-210	91j926132	2021-01-04	2022-01-03
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	2021-03-12	2022-03-11

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
wireless remote thermohygrometer	N/A	433MHz	N/A	2021-04-27	2022-04-26
Standard Light Source	EVERFINE	D908	1012003	2021-10-15	2022-10-14

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 ANSI/IES LM-79-19. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at 25°C±1.2°C during measurement. And relative humidity is maintained between 10% and 65%.The air flow around the SSL product is less than 0.2m/s.

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=21K (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=0.17% of rdg, Power U=0.48% (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. For luminous intensity distribution, The vertical angle (γ) test intervals were set no more than 2.5 degree ,The horizontal angle (C plane) test intervals were set no more than 22.5 degree. For color spatial uniformity, The vertical angle (γ) test intervals were set no more than 90 degree ,The horizontal angle (C plane) test intervals were set no more than 10 degree

The uncertainty of the luminous intensity is U=2.00% (K=2), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_f, R_g was calculated according to IES TM-30-18 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: **Base up**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1169	13.8	0.984	1783.1	129.24

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
5.5317	2959	-0.00204	0.4369	0.3990	0.2528	0.5194

Color Rendering Index

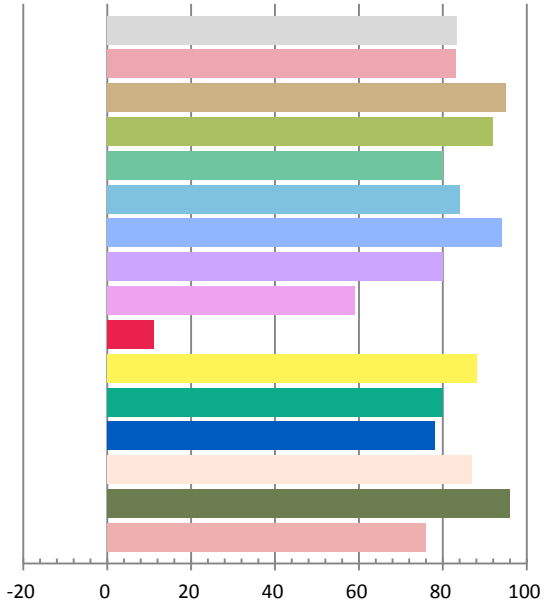
Ra
83.4

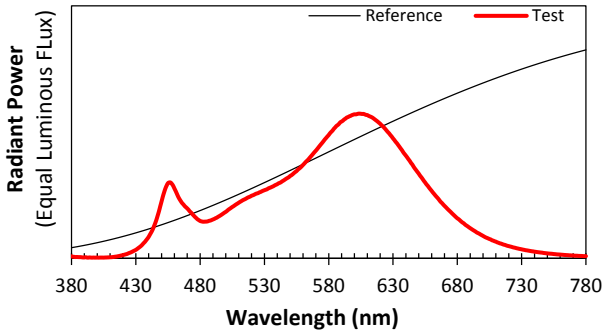
R1	R2	R3	R4
83	95	92	80

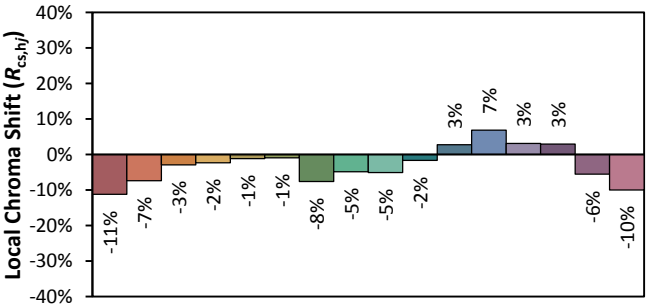
R5	R6	R7	R8
84	94	80	59

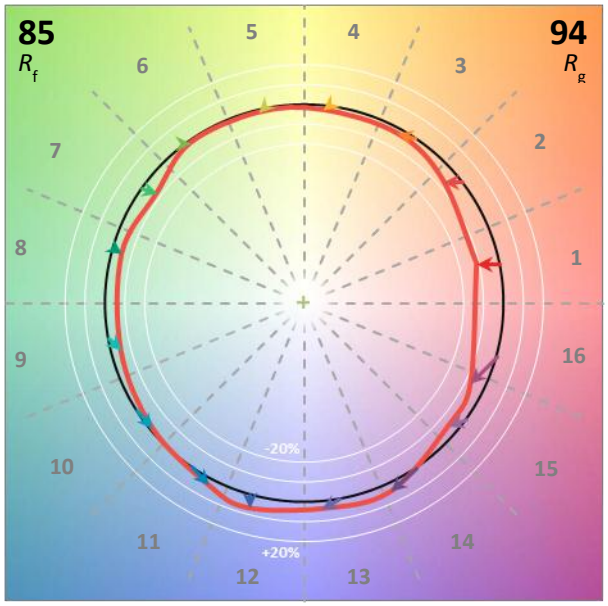
R9	R10	R11	R12
11	88	80	78

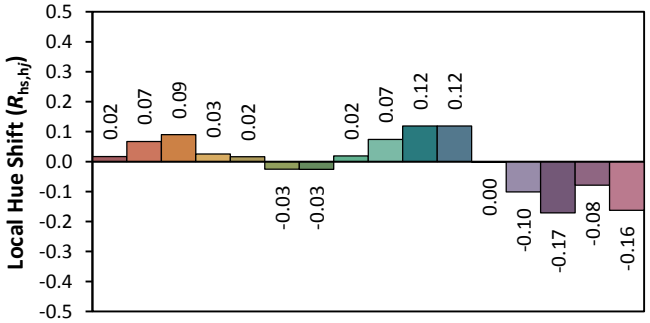
R13	R14	R15
87	96	76

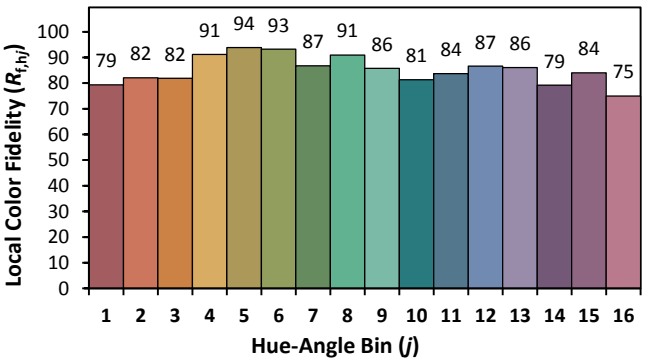


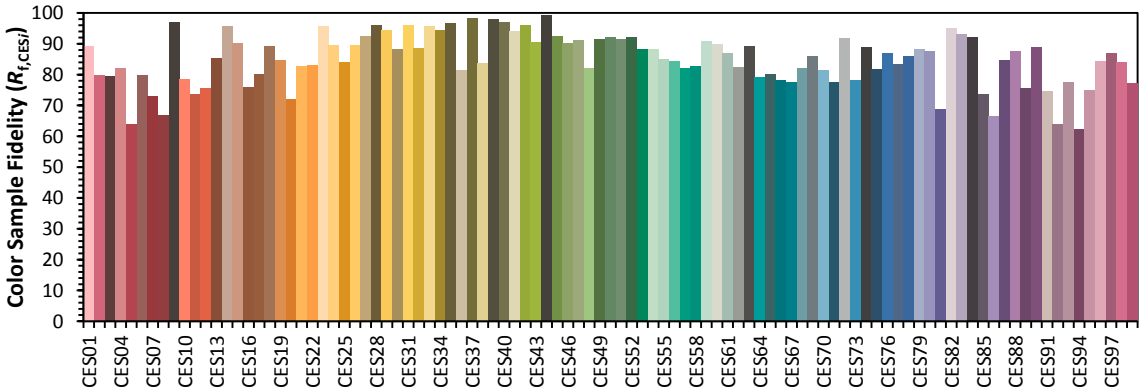

Reference
Test
Radiant Power
(Equal Luminous FLux)
380 430 480 530 580 630 680 730 780
Wavelength (nm)


Local Chroma Shift ($R_{cs,hj}$)
40% 30% 20% 10% 0% -10% -20% -30% -40%
-11% -7% -3% -2% -1% -1% -8% -5% -5% -2% 3% 7% 3% 3% -6% -10%

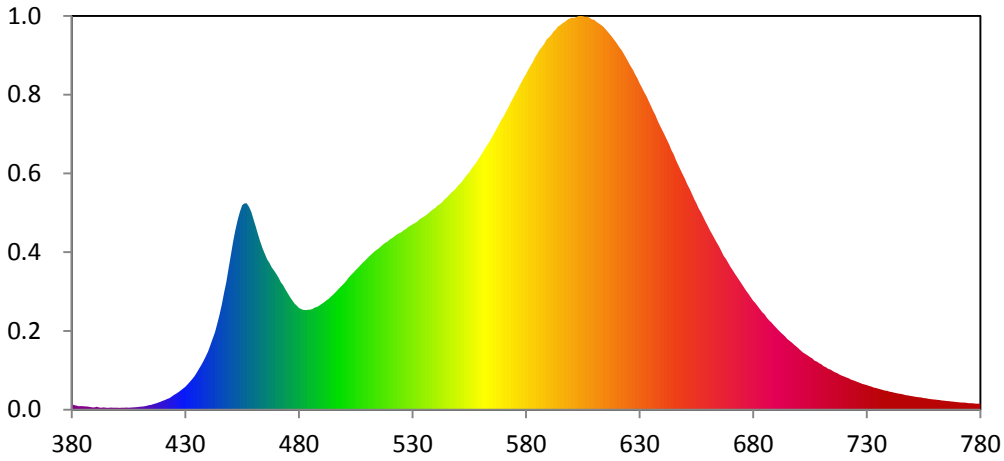

85
R_f
94
R_g
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
-20%
+20%


Local Hue Shift ($R_{hs,hj}$)
0.5 0.4 0.3 0.2 0.1 0.0 -0.1 -0.2 -0.3 -0.4 -0.5
0.02 0.07 0.09 0.03 0.02 -0.03 -0.03 0.02 0.07 0.12 0.12 0.00 -0.10 -0.17 -0.08 -0.16


Local Color Fidelity ($R_{f,hj}$)
100 90 80 70 60 50 40 30 20 10 0
79 82 82 91 94 93 87 91 86 81 84 87 86 79 84 75
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Hue-Angle Bin (j)


Color Sample Fidelity ($R_{f,CESi}$)
100 90 80 70 60 50 40 30 20 10 0
CES01 CES04 CES07 CES10 CES13 CES16 CES19 CES22 CES25 CES28 CES31 CES34 CES37 CES40 CES43 CES46 CES49 CES52 CES55 CES58 CES61 CES64 CES67 CES70 CES73 CES76 CES79 CES82 CES85 CES88 CES91 CES94 CES97

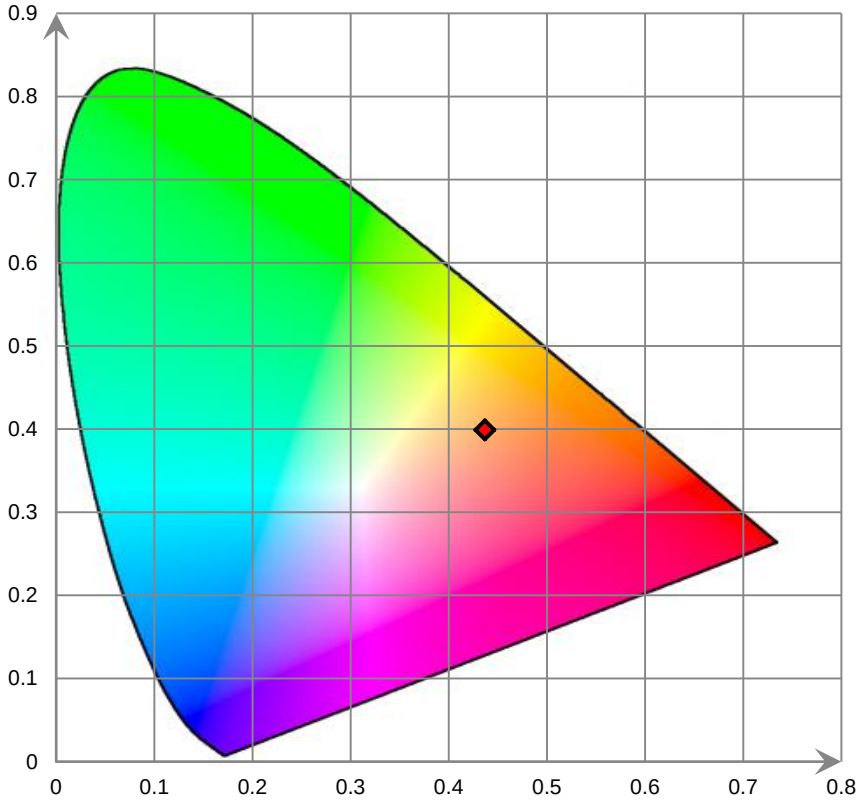
Relative Spectral Power Distribution



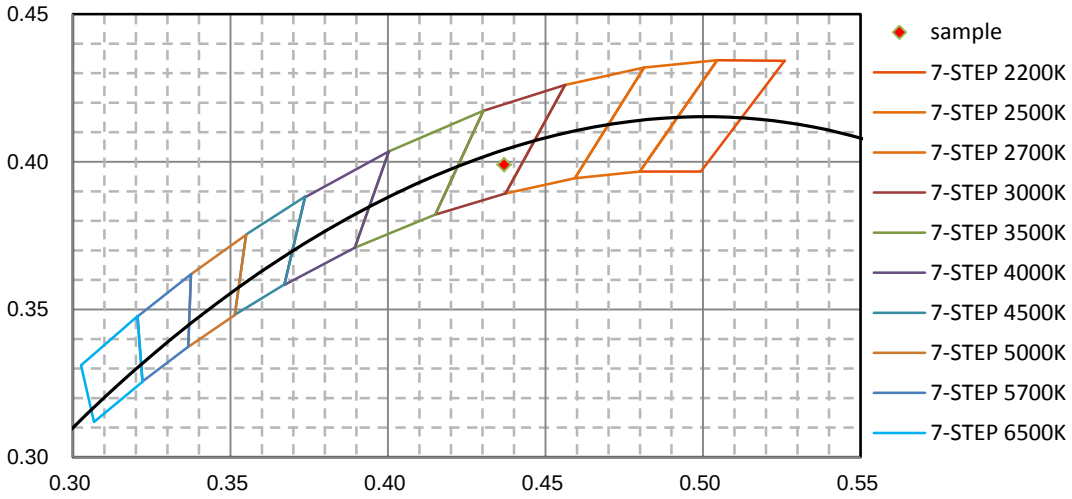
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.354E-01	421	9.278E-01	462	1.665E+01	503	1.281E+01	544	1.995E+01
381	4.339E-01	422	1.033E+00	463	1.591E+01	504	1.304E+01	545	2.014E+01
382	3.902E-01	423	1.111E+00	464	1.530E+01	505	1.328E+01	546	2.037E+01
383	3.294E-01	424	1.265E+00	465	1.478E+01	506	1.348E+01	547	2.060E+01
384	3.525E-01	425	1.405E+00	466	1.428E+01	507	1.372E+01	548	2.079E+01
385	3.335E-01	426	1.524E+00	467	1.394E+01	508	1.395E+01	549	2.099E+01
386	3.152E-01	427	1.681E+00	468	1.351E+01	509	1.415E+01	550	2.129E+01
387	3.073E-01	428	1.857E+00	469	1.321E+01	510	1.437E+01	551	2.149E+01
388	2.662E-01	429	2.018E+00	470	1.290E+01	511	1.459E+01	552	2.175E+01
389	2.249E-01	430	2.194E+00	471	1.255E+01	512	1.478E+01	553	2.205E+01
390	2.289E-01	431	2.420E+00	472	1.213E+01	513	1.499E+01	554	2.232E+01
391	2.865E-01	432	2.673E+00	473	1.182E+01	514	1.516E+01	555	2.256E+01
392	2.088E-01	433	2.920E+00	474	1.143E+01	515	1.531E+01	556	2.292E+01
393	1.862E-01	434	3.192E+00	475	1.107E+01	516	1.550E+01	557	2.318E+01
394	2.318E-01	435	3.518E+00	476	1.072E+01	517	1.570E+01	558	2.346E+01
395	1.972E-01	436	3.895E+00	477	1.041E+01	518	1.584E+01	559	2.379E+01
396	1.779E-01	437	4.235E+00	478	1.009E+01	519	1.598E+01	560	2.415E+01
397	2.041E-01	438	4.659E+00	479	9.887E+00	520	1.618E+01	561	2.449E+01
398	1.867E-01	439	5.082E+00	480	9.664E+00	521	1.630E+01	562	2.487E+01
399	1.875E-01	440	5.550E+00	481	9.562E+00	522	1.645E+01	563	2.519E+01
400	1.981E-01	441	6.140E+00	482	9.481E+00	523	1.663E+01	564	2.551E+01
401	1.816E-01	442	6.731E+00	483	9.470E+00	524	1.676E+01	565	2.591E+01
402	1.971E-01	443	7.370E+00	484	9.492E+00	525	1.685E+01	566	2.630E+01
403	1.978E-01	444	8.165E+00	485	9.504E+00	526	1.704E+01	567	2.668E+01
404	2.006E-01	445	9.002E+00	486	9.571E+00	527	1.716E+01	568	2.708E+01
405	1.888E-01	446	9.957E+00	487	9.702E+00	528	1.733E+01	569	2.748E+01
406	2.161E-01	447	1.105E+01	488	9.767E+00	529	1.748E+01	570	2.784E+01
407	2.227E-01	448	1.216E+01	489	9.904E+00	530	1.761E+01	571	2.824E+01
408	2.398E-01	449	1.344E+01	490	1.006E+01	531	1.774E+01	572	2.866E+01
409	2.521E-01	450	1.467E+01	491	1.019E+01	532	1.785E+01	573	2.909E+01
410	2.814E-01	451	1.595E+01	492	1.038E+01	533	1.807E+01	574	2.950E+01
411	2.992E-01	452	1.705E+01	493	1.052E+01	534	1.821E+01	575	2.989E+01
412	3.326E-01	453	1.805E+01	494	1.075E+01	535	1.834E+01	576	3.031E+01
413	3.739E-01	454	1.882E+01	495	1.093E+01	536	1.850E+01	577	3.075E+01
414	4.310E-01	455	1.944E+01	496	1.114E+01	537	1.865E+01	578	3.113E+01
415	4.674E-01	456	1.961E+01	497	1.136E+01	538	1.886E+01	579	3.152E+01
416	5.403E-01	457	1.960E+01	498	1.159E+01	539	1.902E+01	580	3.189E+01
417	6.009E-01	458	1.927E+01	499	1.183E+01	540	1.917E+01	581	3.234E+01
418	6.833E-01	459	1.878E+01	500	1.203E+01	541	1.940E+01	582	3.270E+01
419	7.607E-01	460	1.807E+01	501	1.229E+01	542	1.952E+01	583	3.304E+01
420	8.544E-01	461	1.739E+01	502	1.258E+01	543	1.971E+01	584	3.349E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.383E+01	626	3.264E+01	667	1.462E+01	708	4.570E+00	749	1.315E+00
586	3.422E+01	627	3.229E+01	668	1.431E+01	709	4.412E+00	750	1.285E+00
587	3.446E+01	628	3.185E+01	669	1.393E+01	710	4.310E+00	751	1.239E+00
588	3.477E+01	629	3.147E+01	670	1.357E+01	711	4.138E+00	752	1.211E+00
589	3.517E+01	630	3.100E+01	671	1.325E+01	712	4.034E+00	753	1.191E+00
590	3.536E+01	631	3.060E+01	672	1.290E+01	713	3.882E+00	754	1.159E+00
591	3.559E+01	632	3.014E+01	673	1.257E+01	714	3.803E+00	755	1.107E+00
592	3.590E+01	633	2.976E+01	674	1.225E+01	715	3.677E+00	756	1.086E+00
593	3.611E+01	634	2.930E+01	675	1.193E+01	716	3.553E+00	757	1.041E+00
594	3.639E+01	635	2.884E+01	676	1.159E+01	717	3.475E+00	758	1.015E+00
595	3.652E+01	636	2.837E+01	677	1.128E+01	718	3.342E+00	759	9.924E-01
596	3.671E+01	637	2.793E+01	678	1.096E+01	719	3.234E+00	760	9.746E-01
597	3.683E+01	638	2.740E+01	679	1.064E+01	720	3.156E+00	761	9.379E-01
598	3.701E+01	639	2.696E+01	680	1.035E+01	721	3.070E+00	762	9.163E-01
599	3.713E+01	640	2.654E+01	681	1.013E+01	722	2.987E+00	763	8.799E-01
600	3.723E+01	641	2.610E+01	682	9.834E+00	723	2.875E+00	764	8.621E-01
601	3.722E+01	642	2.562E+01	683	9.528E+00	724	2.791E+00	765	8.320E-01
602	3.729E+01	643	2.519E+01	684	9.259E+00	725	2.724E+00	766	8.198E-01
603	3.739E+01	644	2.465E+01	685	9.055E+00	726	2.618E+00	767	7.811E-01
604	3.740E+01	645	2.425E+01	686	8.739E+00	727	2.550E+00	768	7.700E-01
605	3.737E+01	646	2.370E+01	687	8.498E+00	728	2.466E+00	769	7.414E-01
606	3.732E+01	647	2.321E+01	688	8.279E+00	729	2.404E+00	770	7.229E-01
607	3.734E+01	648	2.277E+01	689	8.034E+00	730	2.334E+00	771	7.042E-01
608	3.722E+01	649	2.232E+01	690	7.806E+00	731	2.254E+00	772	6.741E-01
609	3.708E+01	650	2.189E+01	691	7.586E+00	732	2.195E+00	773	6.787E-01
610	3.703E+01	651	2.139E+01	692	7.363E+00	733	2.110E+00	774	6.416E-01
611	3.684E+01	652	2.097E+01	693	7.156E+00	734	2.065E+00	775	6.259E-01
612	3.669E+01	653	2.051E+01	694	6.959E+00	735	2.009E+00	776	6.222E-01
613	3.655E+01	654	2.002E+01	695	6.713E+00	736	1.946E+00	777	6.067E-01
614	3.637E+01	655	1.960E+01	696	6.543E+00	737	1.886E+00	778	5.775E-01
615	3.613E+01	656	1.912E+01	697	6.374E+00	738	1.824E+00	779	5.734E-01
616	3.587E+01	657	1.874E+01	698	6.168E+00	739	1.793E+00	780	5.745E-01
617	3.562E+01	658	1.829E+01	699	5.992E+00	740	1.719E+00		
618	3.536E+01	659	1.786E+01	700	5.800E+00	741	1.680E+00		
619	3.507E+01	660	1.746E+01	701	5.607E+00	742	1.624E+00		
620	3.479E+01	661	1.701E+01	702	5.425E+00	743	1.581E+00		
621	3.444E+01	662	1.663E+01	703	5.291E+00	744	1.535E+00		
622	3.415E+01	663	1.622E+01	704	5.143E+00	745	1.495E+00		
623	3.380E+01	664	1.585E+01	705	4.991E+00	746	1.464E+00		
624	3.343E+01	665	1.548E+01	706	4.871E+00	747	1.396E+00		
625	3.303E+01	666	1.505E+01	707	4.668E+00	748	1.358E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

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

Test orientation: **Base up**

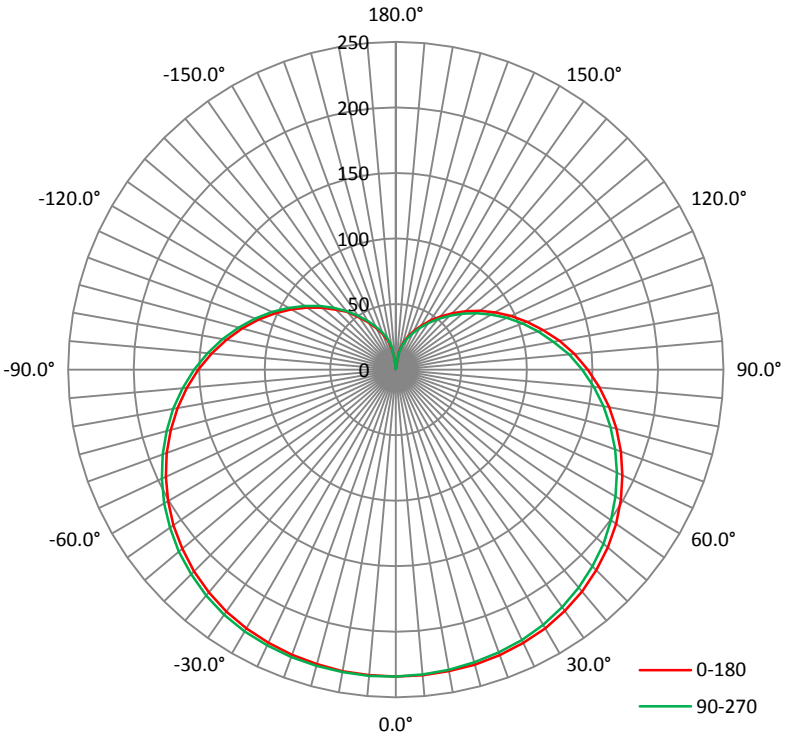
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1168	13.81	0.9844

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1784.45	129.26	234.7	1.47	1.45

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	211.7	211.6	210.8	211.3	211.4
Field Angle (10% I_{max}):	327.4	328.1	327.5	327.3	327.6

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0°	234	234	234	234	234	234	234	234
1°	234	234	234	234	234	234	234	234
2°	234	234	234	234	234	234	234	234
3°	234	234	234	234	234	234	234	234
4°	234	234	234	234	235	234	234	234
5°	234	234	234	234	235	234	234	234
6°	234	234	234	234	234	234	234	234
7°	234	234	234	234	234	234	234	234
8°	234	234	234	234	234	234	234	234
9°	234	234	234	234	234	234	234	234
10°	234	234	234	234	234	234	234	234
11°	233	233	234	234	234	234	234	234
12°	233	234	234	234	235	234	234	234
13°	233	233	234	234	234	234	234	234
14°	233	233	234	234	234	234	234	233
15°	233	233	233	234	234	234	233	233
16°	232	233	233	234	234	234	233	233
17°	232	233	233	234	234	233	233	233
18°	232	232	233	234	234	234	233	233
19°	232	232	233	233	233	233	233	233
20°	232	232	233	233	233	233	233	233
21°	231	232	232	233	233	233	232	233
22°	231	232	232	232	233	233	232	232
23°	231	231	232	232	233	233	232	232
24°	230	231	232	232	233	232	232	231
25°	230	231	231	232	232	232	232	231
26°	230	230	231	232	232	232	231	231
27°	229	230	231	231	232	231	231	231
28°	229	230	230	231	231	231	231	230
29°	228	229	230	230	231	231	230	230
30°	228	229	230	230	231	230	230	229
31°	228	228	229	230	230	230	229	229
32°	227	228	229	229	230	229	229	228
33°	226	227	228	229	229	229	228	228
34°	226	227	228	228	229	229	228	227
35°	225	227	227	228	228	228	227	227
36°	225	226	227	227	228	227	226	226
37°	224	225	226	227	227	226	226	225
38°	223	224	226	226	226	226	225	225
39°	223	224	225	225	226	225	225	224
40°	222	223	224	225	225	225	224	223
41°	221	222	223	224	224	224	223	222
42°	220	221	223	223	223	223	222	222
43°	219	221	222	222	223	222	222	221
44°	218	220	221	221	222	221	221	220
45°	218	219	220	220	221	221	220	219
46°	217	218	219	220	220	220	219	218
47°	216	217	218	219	219	218	218	217
48°	215	216	217	218	218	218	217	216
49°	214	215	217	217	217	217	216	215

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
50°	213	214	215	216	216	215	215	214
51°	212	213	214	215	215	214	214	213
52°	210	212	213	214	214	213	213	211
53°	209	211	212	213	213	212	211	210
54°	208	210	211	212	212	211	210	209
55°	207	209	210	210	210	210	209	208
56°	206	207	209	209	209	209	208	206
57°	205	206	208	208	208	207	206	205
58°	203	205	206	206	207	206	205	204
59°	202	204	205	205	205	205	204	203
60°	201	202	204	204	204	203	202	201
61°	199	201	202	203	203	202	201	200
62°	198	200	201	201	201	201	200	198
63°	197	198	200	200	200	199	198	197
64°	195	197	198	199	199	198	197	195
65°	194	195	197	197	197	196	195	194
66°	192	194	195	196	195	195	194	192
67°	191	192	194	194	194	193	192	191
68°	189	191	192	193	192	192	190	189
69°	187	189	191	191	191	190	189	188
70°	186	188	189	190	189	189	187	186
71°	184	186	188	188	188	187	186	184
72°	183	185	186	187	186	185	184	182
73°	181	183	184	185	184	183	182	181
74°	179	181	183	183	183	182	181	179
75°	178	180	181	182	181	180	179	178
76°	176	178	179	180	179	179	177	176
77°	174	176	178	178	178	177	176	174
78°	172	174	176	176	176	175	174	172
79°	171	173	174	175	174	173	172	170
80°	169	171	172	173	172	172	170	169
81°	167	169	171	171	171	170	168	167
82°	165	167	169	169	169	168	166	165
83°	163	166	167	168	167	166	165	163
84°	162	164	165	166	165	164	163	161
85°	160	162	163	164	163	162	161	160
86°	158	160	161	162	161	160	159	158
87°	156	158	160	160	159	159	157	156
88°	155	156	158	158	158	157	155	154
89°	152	154	156	156	156	155	153	152
90°	151	152	154	154	154	153	152	150
91°	149	151	152	152	152	151	150	148
92°	147	149	150	150	150	149	148	146
93°	145	147	148	148	148	147	146	144
94°	143	145	146	147	146	145	144	142
95°	141	143	144	145	144	143	142	140
96°	139	141	142	143	142	141	140	138
97°	137	139	140	141	140	139	138	136
98°	135	137	138	139	138	137	136	134
99°	133	135	136	137	136	135	134	132

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
100°	131	133	134	135	134	133	132	130
101°	129	131	132	133	132	131	130	128
102°	127	129	130	131	130	129	128	126
103°	125	127	128	129	128	127	126	124
104°	123	125	126	127	126	125	124	122
105°	121	123	124	125	124	123	122	121
106°	119	121	122	123	122	121	120	118
107°	117	119	120	121	120	119	118	116
108°	116	117	118	119	118	117	116	114
109°	114	115	116	117	116	115	114	113
110°	111	113	114	115	114	113	112	111
111°	109	111	112	113	112	111	110	108
112°	108	109	110	111	110	109	108	107
113°	106	107	108	109	108	107	106	105
114°	104	105	106	107	106	105	104	103
115°	102	103	104	105	104	103	102	101
116°	100	101	102	103	102	101	100	99
117°	98	99	100	101	100	99	98	97
118°	96	97	98	99	98	97	96	95
119°	94	95	96	97	96	95	94	93
120°	92	93	94	95	94	93	92	91
121°	90	92	92	93	92	91	90	89
122°	88	90	90	91	90	90	89	87
123°	86	88	89	89	89	88	87	85
124°	84	86	87	87	87	86	85	83
125°	83	84	85	85	85	84	83	82
126°	81	82	83	83	83	82	81	80
127°	79	80	81	81	81	80	79	78
128°	77	78	79	80	79	78	77	76
129°	75	76	77	78	77	77	75	74
130°	73	75	76	76	75	75	74	73
131°	72	73	74	74	74	73	72	71
132°	70	71	72	72	72	71	70	69
133°	68	69	70	70	70	69	68	67
134°	66	68	68	69	68	68	67	66
135°	65	66	67	67	67	66	65	64
136°	63	64	65	65	65	64	63	62
137°	61	63	63	64	63	62	62	61
138°	60	61	62	62	61	61	60	59
139°	58	59	60	60	60	59	58	57
140°	57	58	58	59	58	57	56	55
141°	55	56	57	57	57	56	55	54
142°	53	54	55	55	55	54	53	52
143°	51	52	53	53	53	52	52	51
144°	50	51	52	52	52	51	50	49
145°	48	49	50	50	50	49	49	48
146°	47	48	49	49	49	48	47	46
147°	46	46	47	47	47	47	46	45
148°	44	45	46	46	46	45	44	44
149°	43	44	44	45	44	44	43	42

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
150°	41	42	43	43	43	42	42	41
151°	40	41	42	42	41	41	40	39
152°	39	40	40	40	40	40	39	38
153°	37	38	39	39	39	38	38	37
154°	36	37	37	38	38	37	36	36
155°	35	36	36	36	36	36	35	34
156°	34	34	35	35	35	35	34	33
157°	32	33	34	34	34	33	33	32
158°	31	32	32	33	33	32	31	31
159°	30	31	31	31	31	31	30	30
160°	29	30	30	30	30	30	29	29
161°	28	28	29	29	29	29	28	27
162°	26	27	28	28	28	28	27	26
163°	25	26	27	27	27	26	26	25
164°	24	25	26	26	26	25	25	24
165°	23	24	24	25	25	24	24	23
166°	21	23	23	23	23	23	22	22
167°	20	21	22	22	22	21	21	21
168°	18	20	21	21	20	20	20	19
169°	17	18	19	19	19	19	18	18
170°	15	17	18	18	17	17	17	16
171°	14	15	16	15	15	15	15	14
172°	12	12	14	13	13	13	13	12
173°	11	10	11	10	11	11	11	10
174°	9	8	8	8	8	8	8	7
175°	7	5	6	4	6	6	6	3
176°	4	3	3	2	3	3	3	0
177°	1	1	1	0	1	0	0	0
178°	0	0	0	0	0	0	0	0
179°	0	0	0	0	0	0	0	0
180°	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°	234	234	234	234	234	234	234	234
1°	234	234	234	234	234	234	234	234
2°	234	234	234	234	234	234	234	234
3°	234	234	234	234	234	234	234	234
4°	234	234	234	234	234	234	234	234
5°	234	234	234	234	233	233	233	234
6°	234	234	234	233	233	234	233	234
7°	234	233	233	233	233	233	233	234
8°	234	233	233	233	233	233	233	234
9°	234	233	233	233	233	232	233	233
10°	234	233	233	233	233	233	233	233
11°	234	233	233	232	232	232	232	233
12°	234	233	232	232	232	232	232	233
13°	233	233	232	232	232	232	232	233
14°	233	232	232	232	232	232	232	233
15°	233	232	232	231	231	231	231	232
16°	232	232	231	231	231	231	231	232
17°	232	232	231	231	231	231	231	232
18°	232	231	231	230	230	230	231	232
19°	232	231	230	230	230	230	230	231
20°	232	231	230	230	230	230	230	231
21°	231	231	230	229	229	229	230	231
22°	231	230	230	229	229	229	229	230
23°	231	230	229	229	229	228	229	230
24°	230	229	228	228	228	228	228	229
25°	230	229	228	228	228	228	228	229
26°	230	228	228	227	227	227	228	229
27°	229	228	227	227	226	226	227	228
28°	229	228	227	226	226	226	226	228
29°	228	227	226	226	225	225	226	227
30°	228	227	225	225	225	225	225	227
31°	227	226	225	224	224	224	225	226
32°	227	225	224	224	224	224	224	226
33°	226	225	223	223	223	223	224	225
34°	225	224	223	222	222	222	223	224
35°	225	223	222	222	221	222	222	224
36°	224	223	222	221	221	221	222	223
37°	224	222	221	220	220	220	221	223
38°	223	221	220	219	219	219	220	222
39°	222	220	219	218	218	218	219	221
40°	221	220	218	218	217	217	218	220
41°	220	219	217	217	216	217	218	219
42°	219	217	216	216	215	216	217	218
43°	218	217	215	215	214	215	216	218
44°	217	216	214	214	213	214	215	216
45°	216	215	213	213	212	213	214	216
46°	215	214	212	212	211	212	212	214
47°	214	213	211	210	210	210	212	214
48°	213	212	210	209	209	209	211	213
49°	212	210	209	208	208	208	209	212

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
50°	211	209	208	207	207	207	208	210
51°	210	208	207	206	205	206	207	209
52°	209	207	205	205	204	205	206	208
53°	207	206	204	203	203	203	205	207
54°	206	204	203	202	202	202	203	206
55°	205	203	201	201	200	201	202	204
56°	204	202	200	199	199	200	201	203
57°	202	201	199	198	198	198	200	202
58°	201	199	198	197	196	197	198	201
59°	200	198	196	195	195	195	197	199
60°	198	196	195	194	194	194	196	198
61°	197	195	193	192	192	193	194	196
62°	195	194	192	191	191	191	193	195
63°	194	192	190	189	189	190	191	193
64°	192	190	189	188	188	188	190	192
65°	191	189	187	187	186	187	188	191
66°	189	187	186	185	185	185	187	189
67°	188	186	184	183	183	184	185	188
68°	186	184	183	182	181	182	184	186
69°	184	182	181	180	180	180	182	184
70°	183	181	179	179	178	179	180	183
71°	181	179	178	177	176	177	179	181
72°	179	177	176	175	175	175	177	180
73°	178	176	174	174	173	174	175	178
74°	176	174	173	172	171	172	174	176
75°	174	172	171	170	170	170	172	174
76°	172	171	169	168	168	168	170	173
77°	171	169	167	167	166	167	169	171
78°	169	167	166	165	164	165	167	169
79°	167	165	164	163	163	163	165	168
80°	165	163	162	161	161	162	163	166
81°	163	162	160	159	159	160	161	164
82°	161	160	158	158	157	158	160	162
83°	160	158	157	156	155	156	158	160
84°	158	156	155	154	154	154	156	158
85°	156	154	153	152	152	152	154	157
86°	154	152	151	150	150	151	152	155
87°	152	150	149	148	148	149	151	153
88°	150	149	147	146	146	147	149	151
89°	148	146	145	144	144	145	147	149
90°	147	145	144	143	142	143	145	147
91°	145	143	141	141	140	141	143	145
92°	143	141	140	139	138	139	141	143
93°	141	139	138	137	137	137	139	142
94°	139	137	136	135	135	135	137	139
95°	137	135	134	133	133	133	135	138
96°	135	133	132	131	131	132	134	136
97°	133	131	130	129	128	129	131	134
98°	131	129	128	127	126	127	129	132
99°	129	127	126	124	124	125	127	129

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
100°	127	124	123	122	122	123	125	127
101°	125	123	121	120	120	121	123	125
102°	122	121	119	118	118	119	121	123
103°	120	119	117	117	116	117	119	121
104°	118	117	115	115	114	115	117	119
105°	116	115	114	113	112	113	115	117
106°	114	113	112	111	111	111	113	115
107°	112	111	109	109	109	109	111	113
108°	110	109	108	107	107	108	109	111
109°	109	107	106	105	105	106	107	109
110°	106	105	104	103	103	104	105	107
111°	105	103	102	101	101	102	103	106
112°	102	101	100	99	99	100	101	104
113°	101	99	98	97	97	98	100	102
114°	99	97	96	95	95	96	98	100
115°	97	95	94	93	93	94	96	98
116°	95	93	92	92	91	92	94	96
117°	93	92	91	90	90	90	92	94
118°	91	90	89	88	88	89	90	92
119°	89	88	87	86	86	87	88	90
120°	87	86	85	84	84	85	86	88
121°	85	84	83	82	82	83	85	86
122°	84	82	81	81	80	81	83	85
123°	82	80	79	79	79	79	81	83
124°	80	79	78	77	77	78	79	81
125°	78	77	76	75	75	76	77	79
126°	76	75	74	73	73	74	75	77
127°	75	73	72	72	72	72	74	75
128°	73	72	71	70	70	70	72	74
129°	71	70	69	68	68	69	70	72
130°	69	68	67	66	66	67	68	70
131°	68	66	65	65	65	65	67	68
132°	66	65	64	63	63	64	65	67
133°	64	63	62	61	61	62	63	65
134°	62	61	61	60	60	60	62	63
135°	61	60	59	58	58	59	60	62
136°	59	58	57	57	57	57	58	60
137°	58	57	56	55	55	56	57	58
138°	56	55	54	54	53	54	55	57
139°	54	53	53	52	52	52	54	55
140°	53	52	51	51	50	51	52	54
141°	51	50	50	49	49	49	51	52
142°	50	49	48	48	47	48	49	50
143°	48	47	47	46	46	47	48	49
144°	47	46	45	45	45	45	46	47
145°	45	45	44	43	43	44	45	46
146°	44	43	43	42	42	42	43	45
147°	43	42	41	41	41	41	42	43
148°	41	41	40	39	39	40	40	42
149°	40	39	39	38	38	38	39	40

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
150°	39	38	37	37	37	37	38	39
151°	37	37	36	36	35	36	36	38
152°	36	35	35	34	34	34	35	36
153°	35	34	34	33	33	33	34	35
154°	34	33	32	32	32	32	33	34
155°	32	32	31	31	31	31	31	32
156°	31	31	30	30	29	30	30	31
157°	30	30	29	29	28	28	29	30
158°	29	29	28	27	27	27	28	29
159°	28	27	27	26	26	26	27	28
160°	27	26	26	25	25	25	26	26
161°	26	25	25	24	24	24	25	25
162°	25	24	24	23	23	23	24	24
163°	23	23	23	22	22	22	22	23
164°	22	22	22	21	21	21	21	22
165°	21	21	20	20	20	20	20	21
166°	20	20	19	18	18	18	19	20
167°	18	18	18	17	17	17	18	18
168°	17	17	16	15	16	16	16	17
169°	15	15	15	14	14	14	15	16
170°	14	13	13	12	12	12	13	14
171°	11	10	10	10	10	10	11	12
172°	9	8	8	8	8	8	9	10
173°	5	5	4	4	5	5	7	8
174°	1	1	1	1	1	2	2	4
175°	0	0	0	0	0	0	0	1
176°	0	0	0	0	0	0	0	0
177°	0	0	0	0	0	0	0	0
178°	0	0	0	0	0	0	0	0
179°	0	0	0	0	0	0	0	0
180°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	5.6	0.31
5-10	16.7	0.94
10-15	27.6	1.55
15-20	38.3	2.14
20-25	48.4	2.72
25-30	57.9	3.24
30-35	66.7	3.74
35-40	74.4	4.17
40-45	81.1	4.54
45-50	86.6	4.85
50-55	90.8	5.09
55-60	93.6	5.25
60-65	95.1	5.32
65-70	95.2	5.34
70-75	94.0	5.27
75-80	91.7	5.14
80-85	88.3	4.94
85-90	83.9	4.70
90-95	78.6	4.41
95-100	72.7	4.07
100-105	66.1	3.71
105-110	59.5	3.33
110-115	52.6	2.95
115-120	45.8	2.57
120-125	39.2	2.19
125-130	32.9	1.85
130-135	27.0	1.51
135-140	21.7	1.22
140-145	16.9	0.95
145-150	12.8	0.71
150-155	9.3	0.52
155-160	6.4	0.36
160-165	4.1	0.23
165-170	2.2	0.13
170-175	0.7	0.04
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	5.6	0.31
0-10	22.3	1.25
0-15	50.0	2.80
0-20	88.2	4.94
0-25	136.6	7.66
0-30	194.5	10.90
0-35	261.2	14.64
0-40	335.6	18.81
0-45	416.7	23.35
0-50	503.3	28.20
0-55	594.0	33.29
0-60	687.6	38.54
0-65	782.7	43.86
0-70	877.9	49.20
0-75	972.0	54.47
0-80	1063.7	59.61
0-85	1151.9	64.55
0-90	1235.8	69.25
0-95	1314.4	73.66
0-100	1387.1	77.73
0-105	1453.2	81.44
0-110	1512.6	84.77
0-115	1565.3	87.72
0-120	1611.1	90.29
0-125	1650.3	92.48
0-130	1683.2	94.33
0-135	1710.3	95.84
0-140	1731.9	97.06
0-145	1748.8	98.01
0-150	1761.6	98.72
0-155	1770.9	99.24
0-160	1777.3	99.60
0-165	1781.5	99.83
0-170	1783.7	99.96
0-175	1784.4	100.00
0-180	1784.4	100.00

6. Product Photo

Directions

1. The information marked “superscript #” is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
5. This report cannot be reproduced except in full, without prior written approval of the Company.
6. 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.

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