IES LM-79-19

MEASUREMENT AND TEST REPORT

For

Millennium Lighting LLC.

105 Declaration Dr McDonough, GA 30253 USA

Test Model: LEDRDBC10-SB

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution
Reviewed By:	Hexy He
Report Number:	P2DG211208053-10
Test Date:	2021-12-14 to 2021-12-17
Report Date:	2022-02-15
Approved by:	Bill Xiong / 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 2021-12-08, and used for testing.

Model Tested:	LEDRDBC10-SB
Manufacturer:	Millennium Lighting LLC.
Brand Name:	Millennium
Product Designation:	10”LED bowl shade fixture SY1
Burning Time Before Test:	0hour(For New Products)

#Rated Values:

Rated Voltage/Frequency:	120 V AC 60Hz
Rated Power:	11W
Nominal CCT:	3000K
Nominal Lumen Output:	800lm (for LED Light Engine)

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
2.0m integrating sphere	EVERFINE	R98	11010018	2021-09-27	2022-09-26
spectroradiometer	EVERFINE	HAAS-2000	G112048TS81331121	2021-09-27	2022-09-26
Digital Power Meter	EVERFINE	PF2010A	1011004	2021-09-27	2022-09-26
Digital CC&CV DC Power Supply	EVERFINE	WY305-V1	1101047	2021-06-30	2022-06-29
Standard Light Source	EVERFINE	D204	N/A	2021-10-15	2022-10-14
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010-YF	1011001T	2021-01-04	2022-01-03
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
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=22K (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=0.18% of rdg, Power U=0.46%) (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: **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	0.1129	12.38	0.9137	598.21	48.31

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
2.0763	3059	-0.00405	0.4272	0.3908	0.2500	0.5146

Color Rendering Index

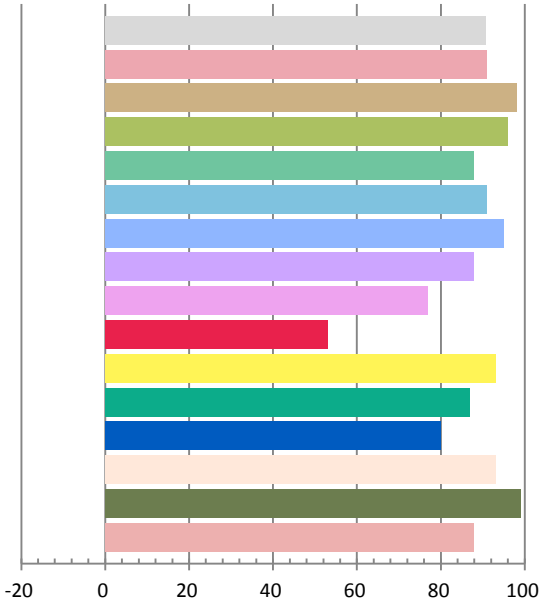
Ra
90.6

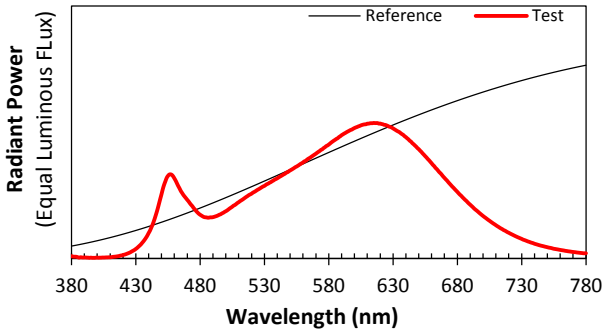
R1	R2	R3	R4
91	98	96	88

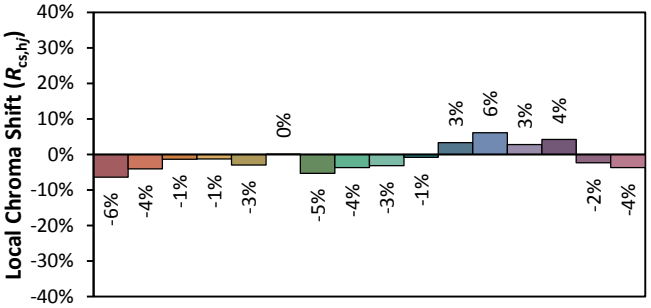
R5	R6	R7	R8
91	95	88	77

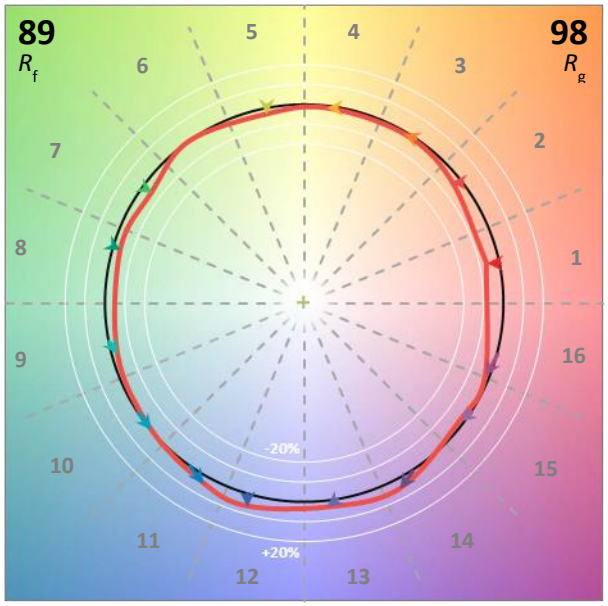
R9	R10	R11	R12
53	93	87	80

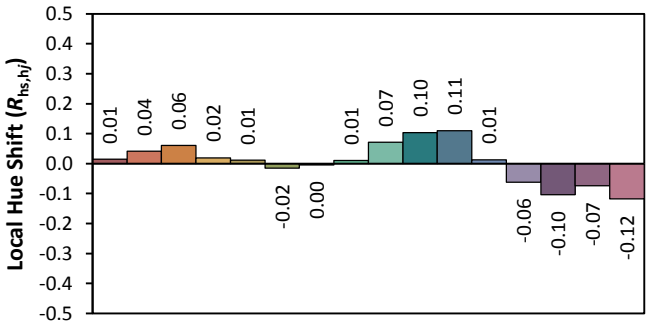
R13	R14	R15
93	99	88

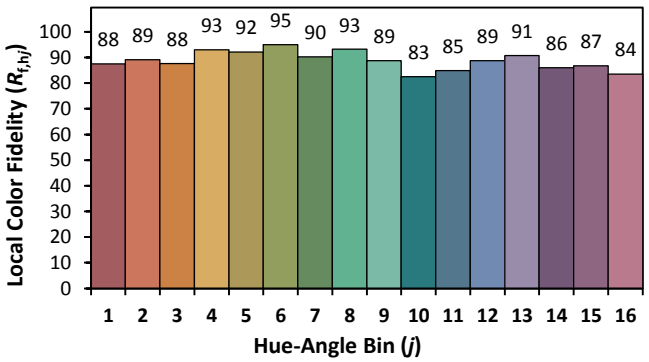


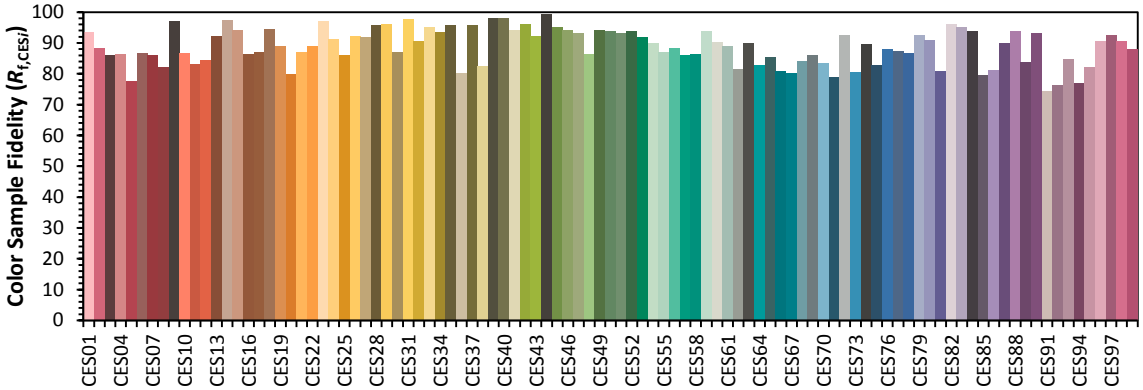

Reference
Test
Radiant Power
(Equal Luminous FLux)
380 430 480 530 580 630 680 730 780
Wavelength (nm)


Local Chroma Shift ($R_{cs,hj}$)
40% 30% 20% 10% 0% -10% -20% -30% -40%
-6% -4% -1% -1% -3% 0% -5% -4% -3% -1% 3% 6% 3% 4% -2% -4%

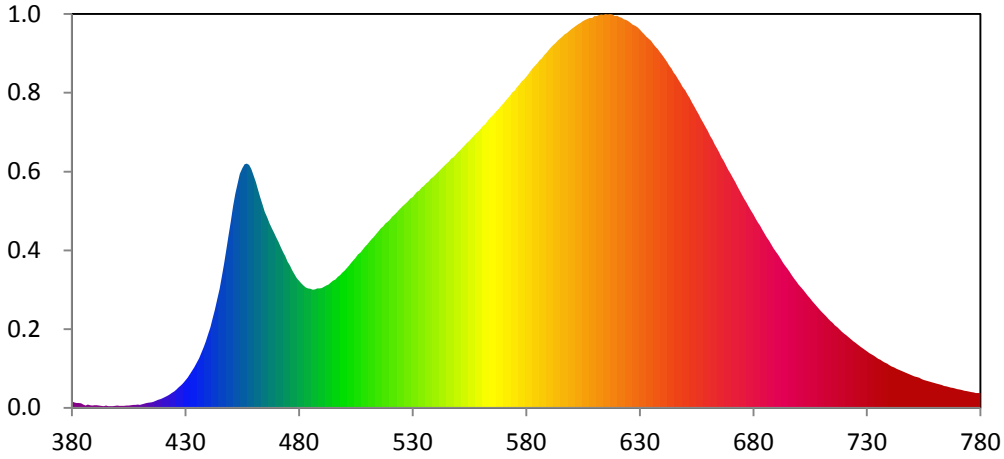

89
R_f
98
R_g
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
-20%
+20%


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
0.01 0.04 0.06 0.02 0.01 -0.02 0.00 0.01 0.07 0.10 0.11 0.01 -0.06 -0.10 -0.07 -0.12


Local Color Fidelity ($R_{f,hj}$)
100 90 80 70 60 50 40 30 20 10 0
88 89 88 93 92 95 90 93 89 83 85 89 91 86 87 84
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

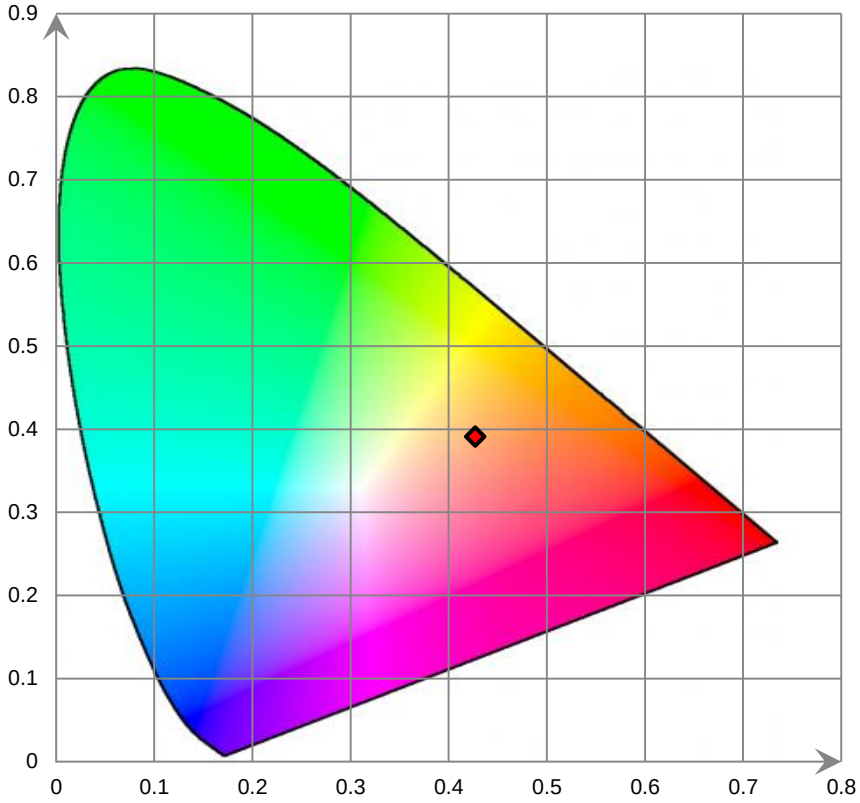
Relative Spectral Power Distribution



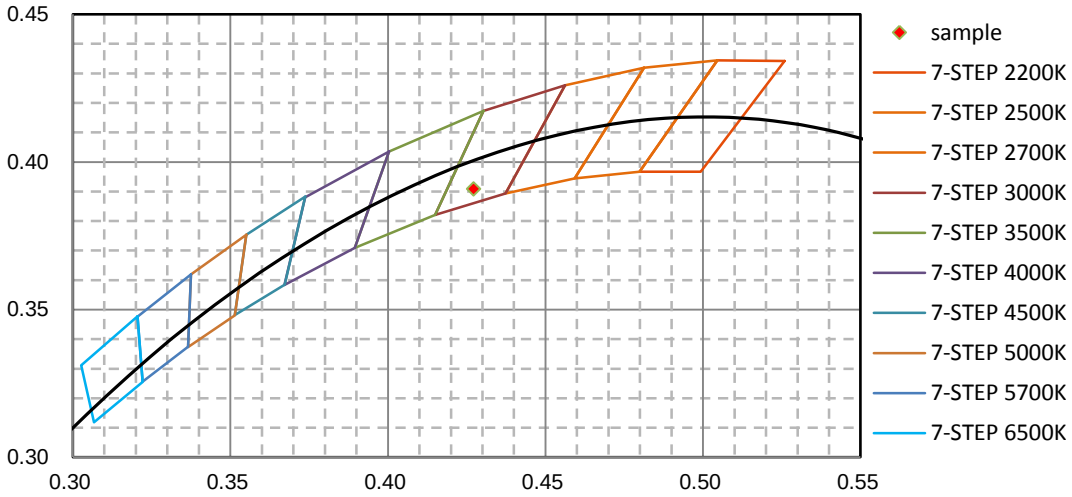
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.913E-01	421	3.198E-01	462	6.501E+00	503	4.327E+00	544	7.212E+00
381	1.610E-01	422	3.511E-01	463	6.270E+00	504	4.401E+00	545	7.282E+00
382	1.441E-01	423	3.951E-01	464	6.063E+00	505	4.478E+00	546	7.339E+00
383	1.427E-01	424	4.388E-01	465	5.840E+00	506	4.569E+00	547	7.431E+00
384	1.307E-01	425	4.857E-01	466	5.671E+00	507	4.626E+00	548	7.471E+00
385	9.235E-02	426	5.416E-01	467	5.498E+00	508	4.709E+00	549	7.551E+00
386	6.078E-02	427	6.081E-01	468	5.352E+00	509	4.800E+00	550	7.623E+00
387	9.458E-02	428	6.683E-01	469	5.215E+00	510	4.870E+00	551	7.686E+00
388	7.899E-02	429	7.338E-01	470	5.074E+00	511	4.956E+00	552	7.757E+00
389	6.967E-02	430	8.172E-01	471	4.943E+00	512	5.028E+00	553	7.826E+00
390	7.525E-02	431	9.007E-01	472	4.785E+00	513	5.097E+00	554	7.904E+00
391	7.379E-02	432	1.003E+00	473	4.642E+00	514	5.178E+00	555	7.961E+00
392	6.166E-02	433	1.107E+00	474	4.518E+00	515	5.260E+00	556	8.030E+00
393	5.930E-02	434	1.215E+00	475	4.359E+00	516	5.339E+00	557	8.104E+00
394	4.468E-02	435	1.351E+00	476	4.233E+00	517	5.412E+00	558	8.184E+00
395	6.345E-02	436	1.482E+00	477	4.091E+00	518	5.492E+00	559	8.244E+00
396	4.537E-02	437	1.636E+00	478	3.975E+00	519	5.547E+00	560	8.318E+00
397	4.681E-02	438	1.800E+00	479	3.866E+00	520	5.607E+00	561	8.409E+00
398	4.313E-02	439	1.982E+00	480	3.784E+00	521	5.695E+00	562	8.451E+00
399	5.877E-02	440	2.196E+00	481	3.711E+00	522	5.754E+00	563	8.547E+00
400	6.272E-02	441	2.396E+00	482	3.643E+00	523	5.818E+00	564	8.631E+00
401	5.352E-02	442	2.660E+00	483	3.585E+00	524	5.896E+00	565	8.696E+00
402	5.965E-02	443	2.914E+00	484	3.561E+00	525	5.964E+00	566	8.766E+00
403	5.888E-02	444	3.216E+00	485	3.550E+00	526	6.026E+00	567	8.848E+00
404	7.069E-02	445	3.553E+00	486	3.525E+00	527	6.099E+00	568	8.924E+00
405	6.921E-02	446	3.917E+00	487	3.533E+00	528	6.168E+00	569	9.002E+00
406	7.388E-02	447	4.302E+00	488	3.557E+00	529	6.236E+00	570	9.075E+00
407	8.349E-02	448	4.725E+00	489	3.555E+00	530	6.283E+00	571	9.161E+00
408	8.340E-02	449	5.152E+00	490	3.572E+00	531	6.364E+00	572	9.239E+00
409	9.197E-02	450	5.564E+00	491	3.603E+00	532	6.437E+00	573	9.314E+00
410	8.927E-02	451	6.014E+00	492	3.641E+00	533	6.482E+00	574	9.406E+00
411	1.042E-01	452	6.381E+00	493	3.677E+00	534	6.560E+00	575	9.458E+00
412	1.248E-01	453	6.678E+00	494	3.729E+00	535	6.611E+00	576	9.562E+00
413	1.384E-01	454	6.972E+00	495	3.785E+00	536	6.690E+00	577	9.632E+00
414	1.487E-01	455	7.151E+00	496	3.825E+00	537	6.749E+00	578	9.731E+00
415	1.651E-01	456	7.264E+00	497	3.899E+00	538	6.829E+00	579	9.786E+00
416	1.824E-01	457	7.285E+00	498	3.950E+00	539	6.880E+00	580	9.866E+00
417	2.045E-01	458	7.241E+00	499	4.026E+00	540	6.942E+00	581	9.954E+00
418	2.371E-01	459	7.115E+00	500	4.086E+00	541	7.013E+00	582	1.005E+01
419	2.546E-01	460	6.930E+00	501	4.155E+00	542	7.083E+00	583	1.013E+01
420	2.876E-01	461	6.734E+00	502	4.237E+00	543	7.147E+00	584	1.021E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.028E+01	626	1.148E+01	667	7.369E+00	708	3.021E+00	749	9.918E-01
586	1.036E+01	627	1.142E+01	668	7.237E+00	709	2.949E+00	750	9.652E-01
587	1.042E+01	628	1.139E+01	669	7.097E+00	710	2.872E+00	751	9.345E-01
588	1.052E+01	629	1.134E+01	670	6.977E+00	711	2.796E+00	752	9.159E-01
589	1.059E+01	630	1.127E+01	671	6.852E+00	712	2.730E+00	753	8.932E-01
590	1.068E+01	631	1.120E+01	672	6.741E+00	713	2.655E+00	754	8.612E-01
591	1.075E+01	632	1.113E+01	673	6.604E+00	714	2.585E+00	755	8.297E-01
592	1.082E+01	633	1.106E+01	674	6.477E+00	715	2.528E+00	756	8.132E-01
593	1.088E+01	634	1.100E+01	675	6.356E+00	716	2.452E+00	757	7.937E-01
594	1.095E+01	635	1.094E+01	676	6.231E+00	717	2.403E+00	758	7.738E-01
595	1.101E+01	636	1.085E+01	677	6.122E+00	718	2.336E+00	759	7.515E-01
596	1.107E+01	637	1.077E+01	678	6.000E+00	719	2.269E+00	760	7.317E-01
597	1.113E+01	638	1.070E+01	679	5.882E+00	720	2.217E+00	761	7.115E-01
598	1.117E+01	639	1.059E+01	680	5.767E+00	721	2.156E+00	762	6.946E-01
599	1.124E+01	640	1.051E+01	681	5.642E+00	722	2.101E+00	763	6.756E-01
600	1.130E+01	641	1.041E+01	682	5.526E+00	723	2.045E+00	764	6.500E-01
601	1.135E+01	642	1.032E+01	683	5.425E+00	724	1.989E+00	765	6.367E-01
602	1.139E+01	643	1.020E+01	684	5.301E+00	725	1.933E+00	766	6.159E-01
603	1.144E+01	644	1.012E+01	685	5.191E+00	726	1.882E+00	767	6.016E-01
604	1.148E+01	645	9.990E+00	686	5.079E+00	727	1.830E+00	768	5.874E-01
605	1.153E+01	646	9.900E+00	687	4.982E+00	728	1.784E+00	769	5.672E-01
606	1.157E+01	647	9.790E+00	688	4.862E+00	729	1.734E+00	770	5.545E-01
607	1.160E+01	648	9.686E+00	689	4.751E+00	730	1.690E+00	771	5.393E-01
608	1.162E+01	649	9.561E+00	690	4.653E+00	731	1.631E+00	772	5.270E-01
609	1.163E+01	650	9.468E+00	691	4.548E+00	732	1.592E+00	773	5.067E-01
610	1.168E+01	651	9.345E+00	692	4.445E+00	733	1.552E+00	774	4.950E-01
611	1.168E+01	652	9.236E+00	693	4.330E+00	734	1.506E+00	775	4.819E-01
612	1.171E+01	653	9.103E+00	694	4.233E+00	735	1.462E+00	776	4.674E-01
613	1.172E+01	654	8.990E+00	695	4.146E+00	736	1.426E+00	777	4.581E-01
614	1.172E+01	655	8.864E+00	696	4.052E+00	737	1.380E+00	778	4.395E-01
615	1.174E+01	656	8.751E+00	697	3.951E+00	738	1.347E+00	779	4.401E-01
616	1.173E+01	657	8.616E+00	698	3.857E+00	739	1.313E+00	780	4.410E-01
617	1.173E+01	658	8.505E+00	699	3.765E+00	740	1.265E+00		
618	1.173E+01	659	8.374E+00	700	3.675E+00	741	1.233E+00		
619	1.168E+01	660	8.246E+00	701	3.588E+00	742	1.200E+00		
620	1.169E+01	661	8.106E+00	702	3.508E+00	743	1.166E+00		
621	1.165E+01	662	7.997E+00	703	3.423E+00	744	1.132E+00		
622	1.163E+01	663	7.850E+00	704	3.338E+00	745	1.102E+00		
623	1.158E+01	664	7.743E+00	705	3.260E+00	746	1.076E+00		
624	1.157E+01	665	7.610E+00	706	3.177E+00	747	1.050E+00		
625	1.153E+01	666	7.472E+00	707	3.098E+00	748	1.018E+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: **Downward**

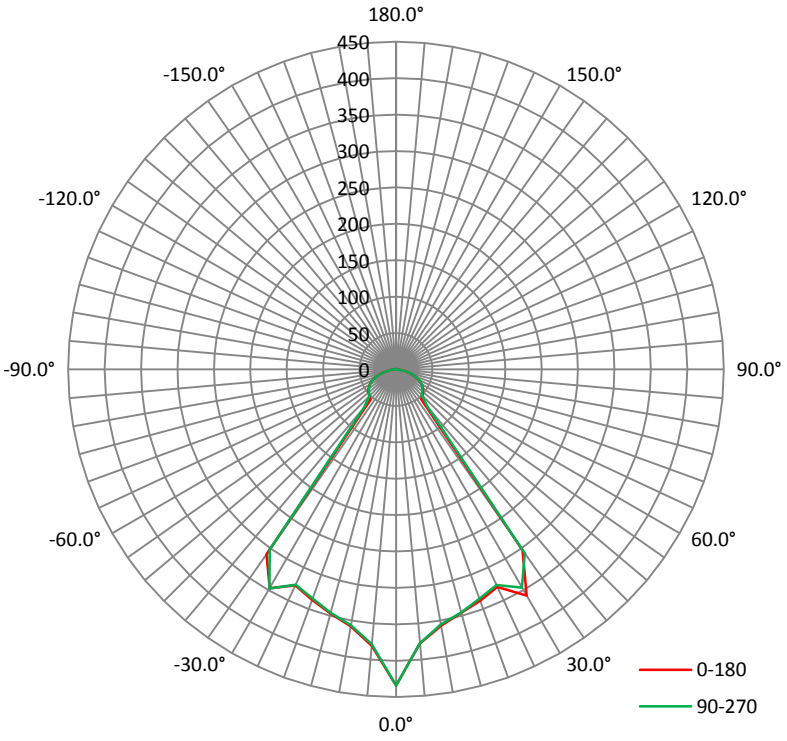
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60	0.1129	12.38	0.9129

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
600.028	48.48	434.2	1.04	1.10

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	72.9	76.0	76.2	76.4	75.4
Field Angle (10% I_{max}):	115.2	113.9	115.1	114.1	114.6

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0°	434	434	434	434	434	434	434	434
1°	429	426	424	423	424	426	430	434
2°	415	414	414	412	411	412	415	421
3°	400	398	397	396	395	396	399	405
4°	387	384	384	386	385	385	389	393
5°	381	378	378	378	379	379	381	382
6°	375	373	374	374	373	375	377	380
7°	374	372	373	371	368	368	372	376
8°	367	365	364	363	362	363	365	370
9°	363	361	360	359	358	360	361	364
10°	358	358	357	358	357	357	358	360
11°	357	355	355	355	354	354	356	358
12°	353	354	353	353	352	353	355	357
13°	354	352	351	351	350	351	353	354
14°	350	349	347	347	348	349	351	352
15°	347	345	346	346	346	347	349	350
16°	344	344	343	344	344	346	347	349
17°	341	341	340	340	341	343	344	346
18°	340	339	338	338	338	340	341	343
19°	338	337	336	336	336	338	340	341
20°	337	335	334	334	335	336	338	339
21°	335	334	333	332	333	334	336	338
22°	333	331	330	330	331	333	334	336
23°	331	330	329	328	329	331	332	334
24°	328	327	327	327	328	329	331	332
25°	327	326	325	324	326	328	329	330
26°	325	323	324	324	326	331	329	329
27°	328	325	323	328	337	337	331	329
28°	336	334	326	334	354	345	342	340
29°	340	347	337	343	361	364	362	358
30°	347	352	350	344	347	354	359	359
31°	345	344	344	332	330	341	341	344
32°	331	333	328	321	319	329	328	333
33°	321	322	318	315	312	319	318	322
34°	314	314	313	311	308	312	311	314
35°	310	308	306	305	302	305	305	306
36°	301	299	297	297	296	298	299	300
37°	192	289	288	288	289	291	293	294
38°	88	237	230	233	239	252	269	278
39°	60	116	106	106	107	116	132	149
40°	55	69	67	67	68	71	74	76
41°	54	54	54	54	54	54	55	55
42°	53	53	53	53	53	53	53	53
43°	53	53	52	53	52	52	53	53
44°	52	52	52	52	52	52	52	52
45°	52	51	51	51	51	51	51	51
46°	51	51	51	51	51	51	51	51
47°	51	50	50	50	50	50	50	50
48°	50	50	50	50	50	50	50	50
49°	50	49	49	49	49	49	49	49

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
50°	49	49	49	49	49	49	49	49
51°	49	48	48	48	48	48	48	48
52°	48	48	48	48	47	47	47	48
53°	47	47	47	47	47	47	47	47
54°	47	46	46	46	46	46	46	46
55°	46	46	46	46	45	45	45	45
56°	45	45	45	45	45	45	44	45
57°	44	44	44	44	44	44	44	44
58°	43	43	43	43	43	43	43	43
59°	43	42	42	42	42	42	42	42
60°	42	41	41	41	41	41	41	41
61°	41	40	40	40	40	40	40	40
62°	40	39	39	39	39	39	39	39
63°	39	38	38	38	38	38	38	38
64°	37	37	37	37	37	37	37	37
65°	36	36	36	36	36	36	36	36
66°	35	34	34	35	35	35	34	34
67°	34	33	33	33	33	33	33	33
68°	32	32	32	32	32	32	32	32
69°	31	30	30	30	31	30	30	30
70°	29	29	29	29	29	29	29	29
71°	28	27	27	27	28	27	27	27
72°	26	26	26	26	26	26	26	26
73°	24	24	24	24	24	24	24	24
74°	23	22	22	23	23	23	22	22
75°	21	21	21	21	21	21	21	21
76°	20	19	19	19	19	19	19	19
77°	18	18	18	18	18	18	18	18
78°	16	16	16	16	16	16	16	16
79°	15	14	15	15	15	15	14	14
80°	13	13	13	13	13	13	13	13
81°	12	11	11	12	12	12	11	11
82°	10	10	10	10	10	10	10	10
83°	9	9	9	9	9	9	8	8
84°	7	7	7	7	7	7	7	7
85°	6	6	6	6	6	6	6	6
86°	5	4	4	4	4	4	4	4
87°	3	3	3	3	3	3	3	3
88°	2	2	2	2	2	2	1	1
89°	1	0	1	0	0	0	0	0
90°	0	0	0	0	0	0	0	0
91°	0	0	0	0	0	0	0	0
92°	0	0	0	0	0	0	0	0
93°	0	0	0	0	0	0	0	0
94°	0	0	0	0	0	0	0	0
95°	0	0	0	0	0	0	0	0
96°	0	0	0	0	0	0	0	0
97°	0	0	0	0	0	0	0	0
98°	0	0	0	0	0	0	0	0
99°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
100°	0	0	0	0	0	0	0	0
101°	0	0	0	0	0	0	0	0
102°	0	0	0	0	0	0	0	0
103°	0	0	0	0	0	0	0	0
104°	0	0	0	0	0	0	0	0
105°	0	0	0	0	0	0	0	0
106°	0	0	0	0	0	0	0	0
107°	0	0	0	0	0	0	0	0
108°	0	0	0	0	0	0	0	0
109°	0	0	0	0	0	0	0	0
110°	0	0	0	0	0	0	0	0
111°	0	0	0	0	0	0	0	0
112°	0	0	0	0	0	0	0	0
113°	0	0	0	0	0	0	0	0
114°	0	0	0	0	0	0	0	0
115°	0	0	0	0	0	0	0	0
116°	0	0	0	0	0	0	0	0
117°	0	0	0	0	0	0	0	0
118°	0	0	0	0	0	0	0	0
119°	0	0	0	0	0	0	0	0
120°	0	0	0	0	0	0	0	0
121°	0	0	0	0	0	0	0	0
122°	0	0	0	0	0	0	0	0
123°	0	0	0	0	0	0	0	0
124°	0	0	0	0	0	0	0	0
125°	0	0	0	0	0	0	0	0
126°	0	0	0	0	0	0	0	0
127°	0	0	0	0	0	0	0	0
128°	0	0	0	0	0	0	0	0
129°	0	0	0	0	0	0	0	0
130°	0	0	0	0	0	0	0	0
131°	0	0	0	0	0	0	0	0
132°	0	0	0	0	0	0	0	0
133°	0	0	0	0	0	0	0	0
134°	0	0	0	0	0	0	0	0
135°	0	0	0	0	0	0	0	0
136°	0	0	0	0	0	0	0	0
137°	0	0	0	0	0	0	0	0
138°	0	0	0	0	0	0	0	0
139°	0	0	0	0	0	0	0	0
140°	0	0	0	0	0	0	0	0
141°	0	0	0	0	0	0	0	0
142°	0	0	0	0	0	0	0	0
143°	0	0	0	0	0	0	0	0
144°	0	0	0	0	0	0	0	0
145°	0	0	0	0	0	0	0	0
146°	0	0	0	0	0	0	0	0
147°	0	0	0	0	0	0	0	0
148°	0	0	0	0	0	0	0	0
149°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
150°	0	0	0	0	0	0	0	0
151°	0	0	0	0	0	0	0	0
152°	0	0	0	1	1	0	0	0
153°	0	0	1	1	1	1	0	0
154°	0	0	1	1	1	1	0	0
155°	0	1	1	1	1	1	1	0
156°	0	1	1	1	1	1	1	1
157°	1	1	1	1	1	1	1	1
158°	1	1	1	1	1	1	1	1
159°	1	1	1	1	1	1	1	1
160°	1	1	1	1	1	1	1	1
161°	1	1	1	1	1	1	1	1
162°	1	1	1	1	1	1	1	1
163°	1	1	1	1	1	1	1	1
164°	1	1	1	1	1	1	1	1
165°	1	1	1	1	1	1	1	1
166°	1	1	1	1	1	1	1	1
167°	1	1	1	1	1	1	1	1
168°	1	1	1	1	1	1	1	1
169°	1	1	1	1	1	1	1	1
170°	1	1	1	1	1	1	1	1
171°	1	1	1	1	1	1	1	1
172°	1	1	1	1	1	1	1	1
173°	1	1	1	1	1	1	1	1
174°	1	1	1	1	1	1	1	1
175°	1	1	1	1	1	1	1	1
176°	1	0	0	1	1	1	1	1
177°	1	0	0	0	0	0	0	1
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°	434	434	434	434	434	434	434	434
1°	429	430	432	433	431	430	427	424
2°	412	413	415	415	411	409	408	407
3°	399	400	402	401	396	395	395	395
4°	385	385	388	387	385	383	385	386
5°	378	376	377	378	377	377	379	382
6°	377	375	375	375	373	374	379	380
7°	372	371	370	368	368	368	370	372
8°	366	367	366	364	363	364	364	365
9°	361	361	361	360	360	358	359	360
10°	357	357	357	355	356	356	356	357
11°	356	356	356	354	353	354	354	355
12°	354	354	354	353	353	353	352	352
13°	352	352	352	350	350	350	350	350
14°	349	350	349	348	347	348	347	348
15°	346	348	347	346	345	346	346	346
16°	344	346	346	345	344	345	344	344
17°	343	342	342	342	342	341	340	340
18°	341	341	340	339	338	339	338	339
19°	340	339	339	337	337	337	337	338
20°	338	338	336	335	335	336	335	336
21°	337	336	335	334	333	334	334	334
22°	335	334	333	332	332	332	333	333
23°	333	332	331	330	330	330	330	330
24°	331	331	329	329	328	328	328	328
25°	329	329	327	327	327	326	326	327
26°	328	328	326	326	325	325	324	325
27°	331	331	326	328	329	330	325	329
28°	341	339	340	338	345	341	336	343
29°	358	350	354	347	353	352	361	361
30°	359	354	355	346	346	352	361	359
31°	343	349	349	339	335	346	339	341
32°	329	337	333	332	332	330	325	326
33°	320	325	323	322	324	319	318	320
34°	313	316	317	316	318	316	314	314
35°	303	306	308	306	308	308	305	306
36°	225	297	297	297	297	296	296	297
37°	146	287	288	288	289	288	287	286
38°	68	212	213	215	215	214	212	211
39°	55	137	139	141	142	140	137	135
40°	53	62	64	67	68	66	63	60
41°	53	53	52	52	52	52	52	53
42°	52	52	51	51	51	51	51	52
43°	52	51	51	51	51	51	51	52
44°	52	51	50	50	50	50	50	51
45°	51	51	50	50	50	50	50	51
46°	51	50	50	49	49	49	50	50
47°	50	50	49	49	49	49	49	50
48°	50	49	49	49	49	49	49	49
49°	49	49	48	48	48	48	48	49

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
50°	49	48	48	47	47	47	48	48
51°	48	47	47	47	47	47	47	48
52°	47	47	46	46	46	46	46	47
53°	47	46	46	46	46	46	46	46
54°	46	45	45	45	45	45	45	46
55°	45	45	44	44	44	44	44	45
56°	44	44	44	44	44	44	44	44
57°	44	43	43	43	43	43	43	43
58°	43	42	42	42	42	42	42	43
59°	42	41	41	41	41	41	41	42
60°	41	40	40	40	40	40	40	41
61°	40	39	39	39	40	39	39	40
62°	39	38	38	38	39	38	38	39
63°	38	37	37	37	38	38	37	38
64°	36	36	36	36	37	36	36	36
65°	35	35	35	35	35	35	35	35
66°	34	34	34	34	34	34	34	34
67°	32	32	32	33	33	33	33	33
68°	31	31	31	31	32	32	31	31
69°	29	29	30	30	30	30	30	30
70°	28	28	28	29	29	29	28	28
71°	26	26	27	27	27	27	27	27
72°	25	25	25	26	26	26	25	25
73°	23	23	24	24	24	24	24	23
74°	22	22	22	23	23	23	22	22
75°	20	20	20	21	21	21	21	20
76°	18	19	19	19	20	19	19	19
77°	17	17	17	18	18	18	17	17
78°	15	15	16	16	16	16	16	15
79°	14	14	14	15	15	15	14	14
80°	12	12	13	13	13	13	13	12
81°	11	11	11	12	12	12	11	11
82°	9	9	10	10	10	10	10	9
83°	8	8	8	9	9	9	8	8
84°	6	6	7	7	8	7	7	7
85°	5	5	5	6	6	6	6	5
86°	3	4	4	5	5	5	4	4
87°	2	2	3	3	3	3	3	2
88°	1	1	1	2	2	2	2	1
89°	0	0	0	0	0	0	0	0
90°	0	0	0	0	0	0	0	0
91°	0	0	0	0	0	0	0	0
92°	0	0	0	0	0	0	0	0
93°	0	0	0	0	0	0	0	0
94°	0	0	0	0	0	0	0	0
95°	0	0	0	0	0	0	0	0
96°	0	0	0	0	0	0	0	0
97°	0	0	0	0	0	0	0	0
98°	0	0	0	0	0	0	0	0
99°	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°
100°	0	0	0	0	0	0	0	0
101°	0	0	0	0	0	0	0	0
102°	0	0	0	0	0	0	0	0
103°	0	0	0	0	0	0	0	0
104°	0	0	0	0	0	0	0	0
105°	0	0	0	0	0	0	0	0
106°	0	0	0	0	0	0	0	0
107°	0	0	0	0	0	0	0	0
108°	0	0	0	0	0	0	0	0
109°	0	0	0	0	0	0	0	0
110°	0	0	0	0	0	0	0	0
111°	0	0	0	0	0	0	0	0
112°	0	0	0	0	0	0	0	0
113°	0	0	0	0	0	0	0	0
114°	0	0	0	0	0	0	0	0
115°	0	0	0	0	0	0	0	0
116°	0	0	0	0	0	0	0	0
117°	0	0	0	0	0	0	0	0
118°	0	0	0	0	0	0	0	0
119°	0	0	0	0	0	0	0	0
120°	0	0	0	0	0	0	0	0
121°	0	0	0	0	0	0	0	0
122°	0	0	0	0	0	0	0	0
123°	0	0	0	0	0	0	0	0
124°	0	0	0	0	0	0	0	0
125°	0	0	0	0	0	0	0	0
126°	0	0	0	0	0	0	0	0
127°	0	0	0	0	0	0	0	0
128°	0	0	0	0	0	0	0	0
129°	0	0	0	0	0	0	0	0
130°	0	0	0	0	0	0	0	0
131°	0	0	0	0	0	0	0	0
132°	0	0	0	0	0	0	0	0
133°	0	0	0	0	0	0	0	0
134°	0	0	0	0	0	0	0	0
135°	0	0	0	0	0	0	0	0
136°	0	0	0	0	0	0	0	0
137°	0	0	0	0	0	0	0	0
138°	0	0	0	0	0	0	0	0
139°	0	0	0	0	0	0	0	0
140°	0	0	0	0	0	0	0	0
141°	0	0	0	0	0	0	0	0
142°	0	0	0	0	0	0	0	0
143°	0	0	0	0	0	0	0	0
144°	0	0	0	0	0	0	0	0
145°	0	0	0	0	0	0	0	0
146°	0	0	0	0	0	0	0	0
147°	0	0	0	0	0	0	0	0
148°	0	0	0	0	0	0	0	0
149°	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°
150°	0	0	0	0	0	0	0	0
151°	0	0	0	0	0	0	0	0
152°	0	0	0	0	0	0	0	0
153°	0	0	0	0	0	0	0	0
154°	0	0	0	0	0	0	0	0
155°	0	0	0	0	0	0	0	0
156°	0	0	0	0	0	0	0	0
157°	0	0	0	0	0	0	0	0
158°	0	0	0	0	0	0	0	0
159°	0	0	0	0	0	0	0	0
160°	0	0	0	0	0	0	0	0
161°	0	0	0	0	0	0	0	0
162°	0	0	0	0	0	0	0	0
163°	0	0	0	0	0	0	0	0
164°	0	0	0	0	0	0	0	0
165°	0	0	0	0	0	0	0	0
166°	0	0	0	0	0	0	0	0
167°	0	0	0	0	0	0	0	0
168°	0	0	0	0	0	0	0	0
169°	0	0	0	0	0	0	0	0
170°	0	0	0	0	0	0	0	0
171°	0	0	0	0	0	0	0	0
172°	0	0	0	0	0	0	0	0
173°	0	0	0	0	0	0	0	0
174°	0	0	0	0	0	0	0	0
175°	0	0	0	0	0	0	0	0
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	9.5	1.58
5-10	26.2	4.37
10-15	41.7	6.96
15-20	56.2	9.36
20-25	69.5	11.58
25-30	85.5	14.26
30-35	96.1	16.01
35-40	71.6	11.93
40-45	19.7	3.29
45-50	20.0	3.33
50-55	20.3	3.39
55-60	19.9	3.31
60-65	18.6	3.11
65-70	16.3	2.71
70-75	12.9	2.15
75-80	9.0	1.50
80-85	5.0	0.83
85-90	1.3	0.22
90-95	0.0	0.00
95-100	0.0	0.00
100-105	0.0	0.00
105-110	0.0	0.00
110-115	0.0	0.00
115-120	0.0	0.00
120-125	0.0	0.01
125-130	0.0	0.00
130-135	0.0	0.01
135-140	0.1	0.01
140-145	0.1	0.01
145-150	0.1	0.02
150-155	0.1	0.01
155-160	0.1	0.01
160-165	0.1	0.01
165-170	0.1	0.01
170-175	0.0	0.01
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	9.5	1.58
0-10	35.7	5.95
0-15	77.4	12.91
0-20	133.6	22.27
0-25	203.1	33.85
0-30	288.7	48.11
0-35	384.7	64.12
0-40	456.3	76.05
0-45	476.0	79.34
0-50	496.1	82.67
0-55	516.4	86.06
0-60	536.3	89.37
0-65	554.9	92.48
0-70	571.2	95.19
0-75	584.1	97.34
0-80	593.1	98.84
0-85	598.1	99.67
0-90	599.3	99.89
0-95	599.3	99.89
0-100	599.4	99.89
0-105	599.4	99.89
0-110	599.4	99.89
0-115	599.4	99.89
0-120	599.4	99.89
0-125	599.4	99.90
0-130	599.4	99.90
0-135	599.5	99.91
0-140	599.5	99.92
0-145	599.6	99.93
0-150	599.7	99.95
0-155	599.8	99.96
0-160	599.9	99.97
0-165	599.9	99.98
0-170	600.0	99.99
0-175	600.0	100.00
0-180	600.0	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=2 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**********