IES LM-79-19

MEASUREMENT AND TEST REPORT

For

Millennium Lighting LLC.

105 Declaration Dr McDonough, GA 30253 USA

Test Model: LEDRAS12-SB

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution
Reviewed By:	Hexy He
Report Number:	P2DG211208052-10
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:	LEDRAS12-SB
Manufacturer:	Millennium Lighting LLC.
Brand Name:	Millennium
Product Designation:	12”LED angle 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	0.1131	12.45	0.9169	622.15	49.97

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
2.2018	2955	-0.00482	0.4331	0.3909	0.2539	0.5155

Color Rendering Index

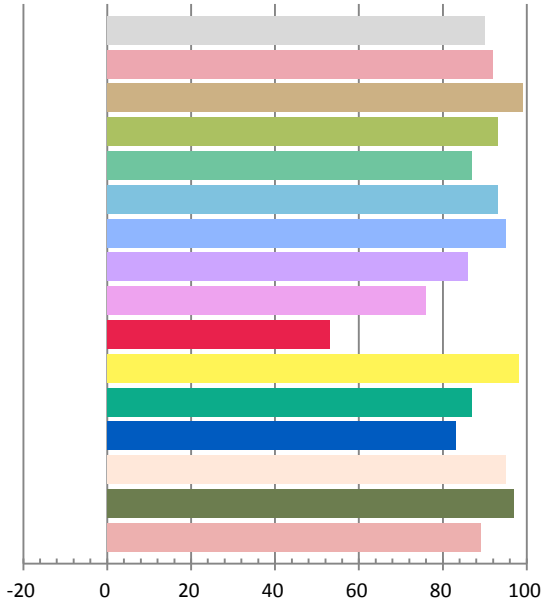
Ra
90.0

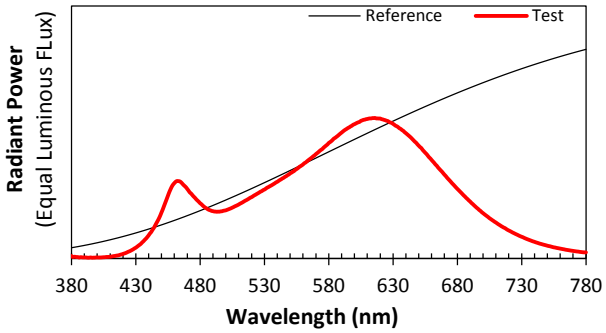
R1	R2	R3	R4
92	99	93	87

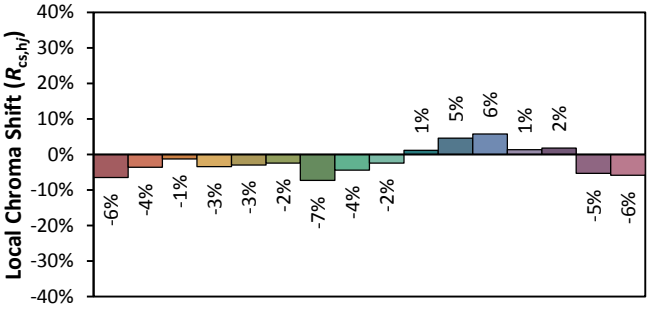
R5	R6	R7	R8
93	95	86	76

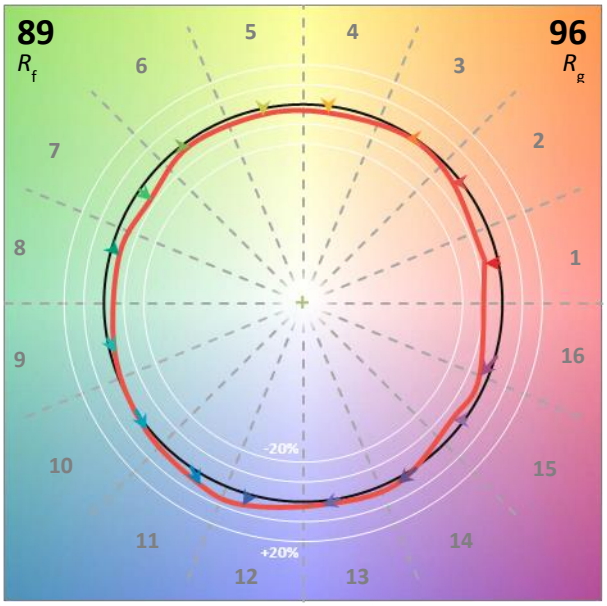
R9	R10	R11	R12
53	98	87	83

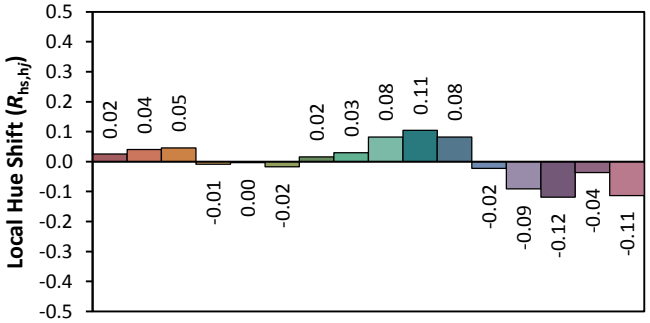
R13	R14	R15
95	97	89

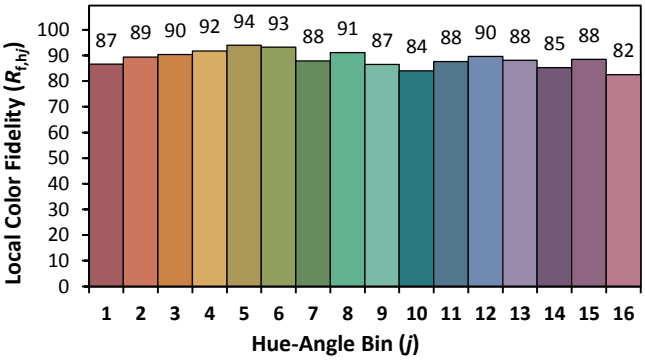


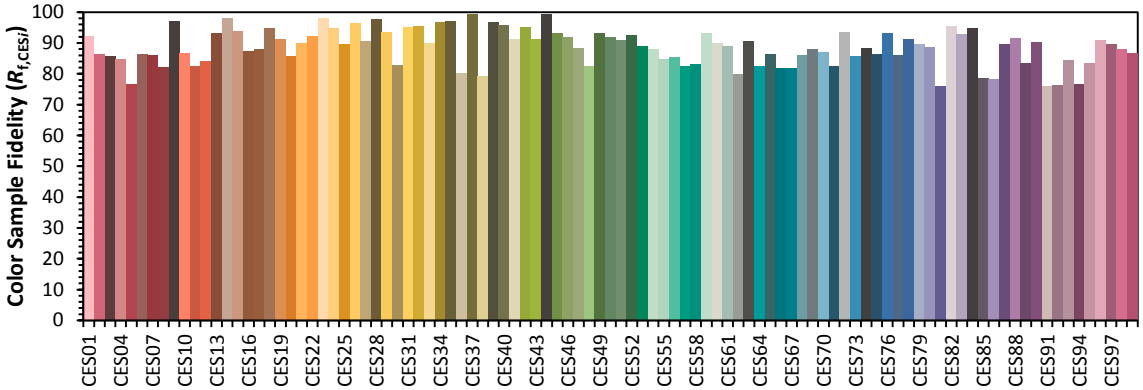

Reference
Test
Radiant Power
(Equal Luminous FLux)
380 430 480 530 580 630 680 730 780
Wavelength (nm)


Local Chroma Shift ($R_{cs,hj}$)
40% 30% 20% 10% 0% -10% -20% -30% -40%
-6% -4% -1% -3% -3% -2% -7% -4% -2% 1% 5% 6% 1% 2% -5% -6%

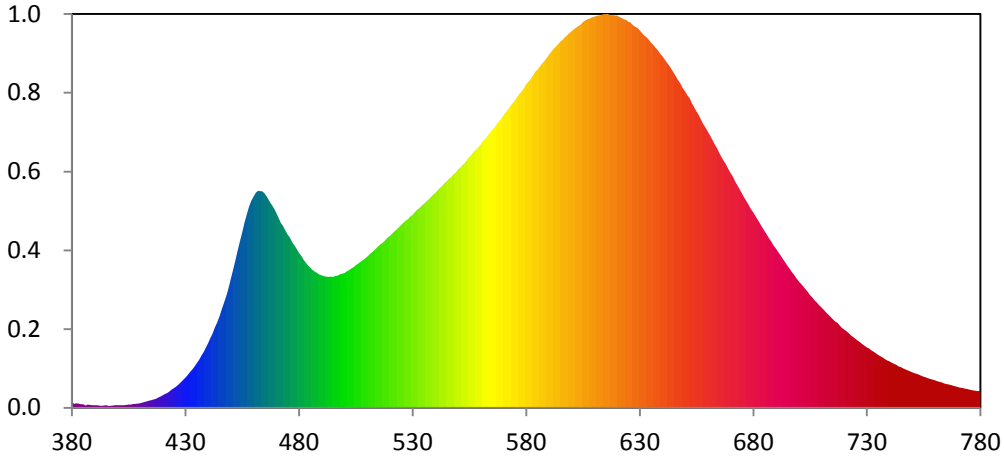

89
R_f
96
R_g
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
-20%
+20%


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 0.04 0.05 -0.01 0.00 -0.02 0.02 0.03 0.08 0.11 0.08 -0.02 -0.09 -0.12 -0.04 -0.11


Local Color Fidelity ($R_{f,hj}$)
100 90 80 70 60 50 40 30 20 10 0
87 89 90 92 94 93 88 91 87 84 88 90 88 85 88 82
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

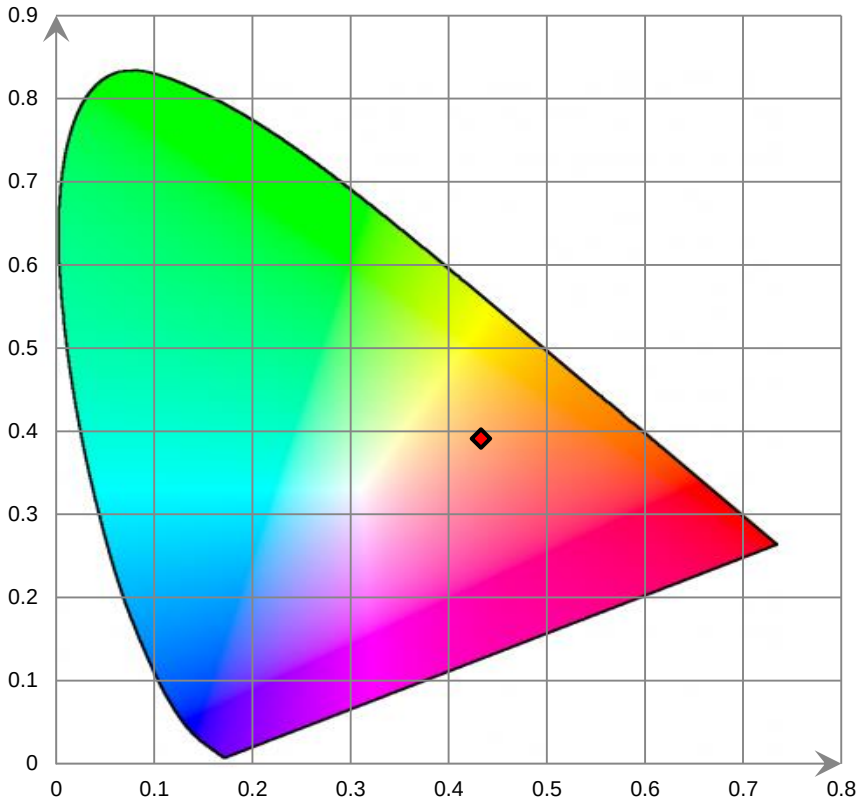
Relative Spectral Power Distribution



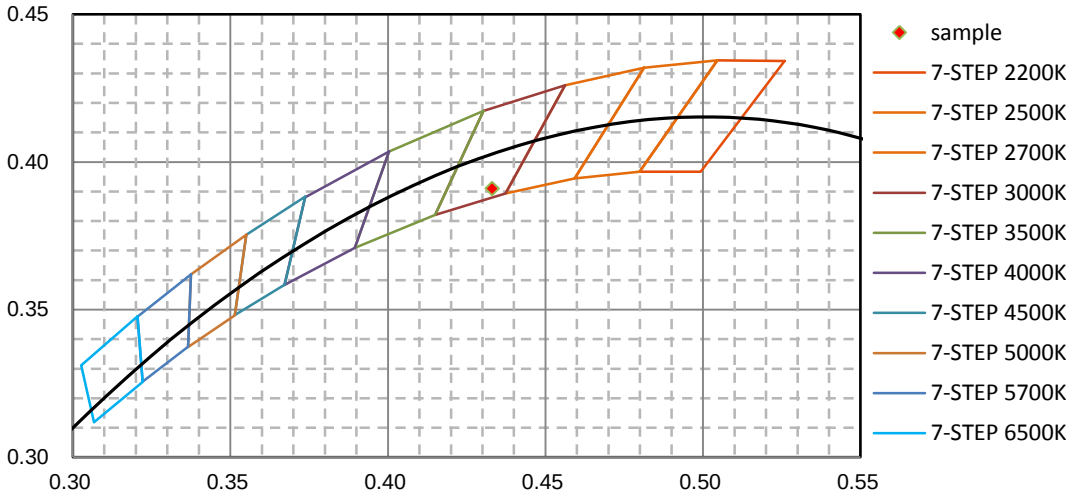
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.115E-01	421	4.377E-01	462	6.972E+00	503	4.469E+00	544	7.209E+00
381	1.219E-01	422	4.760E-01	463	6.965E+00	504	4.515E+00	545	7.268E+00
382	1.439E-01	423	5.276E-01	464	6.949E+00	505	4.572E+00	546	7.354E+00
383	1.371E-01	424	5.860E-01	465	6.879E+00	506	4.626E+00	547	7.415E+00
384	1.142E-01	425	6.328E-01	466	6.761E+00	507	4.690E+00	548	7.507E+00
385	1.128E-01	426	6.882E-01	467	6.632E+00	508	4.740E+00	549	7.564E+00
386	7.283E-02	427	7.521E-01	468	6.522E+00	509	4.797E+00	550	7.666E+00
387	1.041E-01	428	8.185E-01	469	6.409E+00	510	4.855E+00	551	7.728E+00
388	9.297E-02	429	8.992E-01	470	6.260E+00	511	4.928E+00	552	7.805E+00
389	8.064E-02	430	9.625E-01	471	6.106E+00	512	4.988E+00	553	7.871E+00
390	8.255E-02	431	1.049E+00	472	5.944E+00	513	5.052E+00	554	7.976E+00
391	8.277E-02	432	1.140E+00	473	5.843E+00	514	5.122E+00	555	8.050E+00
392	6.836E-02	433	1.227E+00	474	5.705E+00	515	5.196E+00	556	8.134E+00
393	5.510E-02	434	1.318E+00	475	5.574E+00	516	5.252E+00	557	8.230E+00
394	6.526E-02	435	1.444E+00	476	5.461E+00	517	5.320E+00	558	8.308E+00
395	7.931E-02	436	1.546E+00	477	5.320E+00	518	5.391E+00	559	8.383E+00
396	5.629E-02	437	1.680E+00	478	5.209E+00	519	5.467E+00	560	8.468E+00
397	6.405E-02	438	1.791E+00	479	5.098E+00	520	5.518E+00	561	8.576E+00
398	6.614E-02	439	1.931E+00	480	4.975E+00	521	5.592E+00	562	8.642E+00
399	7.801E-02	440	2.078E+00	481	4.883E+00	522	5.672E+00	563	8.741E+00
400	8.300E-02	441	2.243E+00	482	4.765E+00	523	5.732E+00	564	8.840E+00
401	7.705E-02	442	2.382E+00	483	4.665E+00	524	5.803E+00	565	8.928E+00
402	7.776E-02	443	2.577E+00	484	4.574E+00	525	5.870E+00	566	9.014E+00
403	7.940E-02	444	2.739E+00	485	4.509E+00	526	5.940E+00	567	9.104E+00
404	8.820E-02	445	2.949E+00	486	4.425E+00	527	6.015E+00	568	9.207E+00
405	9.939E-02	446	3.172E+00	487	4.368E+00	528	6.066E+00	569	9.290E+00
406	1.032E-01	447	3.380E+00	488	4.329E+00	529	6.151E+00	570	9.400E+00
407	1.228E-01	448	3.605E+00	489	4.277E+00	530	6.202E+00	571	9.490E+00
408	1.250E-01	449	3.859E+00	490	4.255E+00	531	6.279E+00	572	9.585E+00
409	1.313E-01	450	4.144E+00	491	4.224E+00	532	6.367E+00	573	9.693E+00
410	1.390E-01	451	4.428E+00	492	4.218E+00	533	6.422E+00	574	9.783E+00
411	1.627E-01	452	4.736E+00	493	4.202E+00	534	6.492E+00	575	9.859E+00
412	1.845E-01	453	5.039E+00	494	4.213E+00	535	6.554E+00	576	9.982E+00
413	2.067E-01	454	5.342E+00	495	4.209E+00	536	6.619E+00	577	1.008E+01
414	2.220E-01	455	5.657E+00	496	4.236E+00	537	6.694E+00	578	1.018E+01
415	2.466E-01	456	5.962E+00	497	4.246E+00	538	6.764E+00	579	1.027E+01
416	2.630E-01	457	6.227E+00	498	4.287E+00	539	6.849E+00	580	1.040E+01
417	2.883E-01	458	6.469E+00	499	4.309E+00	540	6.905E+00	581	1.048E+01
418	3.304E-01	459	6.658E+00	500	4.333E+00	541	6.984E+00	582	1.057E+01
419	3.570E-01	460	6.789E+00	501	4.377E+00	542	7.065E+00	583	1.068E+01
420	3.990E-01	461	6.907E+00	502	4.421E+00	543	7.130E+00	584	1.080E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.087E+01	626	1.238E+01	667	7.941E+00	708	3.384E+00	749	1.173E+00
586	1.096E+01	627	1.230E+01	668	7.823E+00	709	3.297E+00	750	1.139E+00
587	1.105E+01	628	1.225E+01	669	7.685E+00	710	3.230E+00	751	1.111E+00
588	1.115E+01	629	1.221E+01	670	7.542E+00	711	3.146E+00	752	1.090E+00
589	1.125E+01	630	1.213E+01	671	7.423E+00	712	3.066E+00	753	1.056E+00
590	1.134E+01	631	1.205E+01	672	7.275E+00	713	2.997E+00	754	1.024E+00
591	1.144E+01	632	1.196E+01	673	7.150E+00	714	2.916E+00	755	9.939E-01
592	1.153E+01	633	1.191E+01	674	7.026E+00	715	2.850E+00	756	9.765E-01
593	1.161E+01	634	1.183E+01	675	6.896E+00	716	2.780E+00	757	9.461E-01
594	1.168E+01	635	1.173E+01	676	6.761E+00	717	2.730E+00	758	9.242E-01
595	1.176E+01	636	1.167E+01	677	6.646E+00	718	2.648E+00	759	9.029E-01
596	1.182E+01	637	1.157E+01	678	6.519E+00	719	2.574E+00	760	8.783E-01
597	1.190E+01	638	1.150E+01	679	6.388E+00	720	2.514E+00	761	8.568E-01
598	1.196E+01	639	1.138E+01	680	6.269E+00	721	2.456E+00	762	8.314E-01
599	1.205E+01	640	1.129E+01	681	6.155E+00	722	2.393E+00	763	8.134E-01
600	1.210E+01	641	1.119E+01	682	6.034E+00	723	2.327E+00	764	7.837E-01
601	1.216E+01	642	1.109E+01	683	5.917E+00	724	2.273E+00	765	7.651E-01
602	1.222E+01	643	1.099E+01	684	5.795E+00	725	2.214E+00	766	7.457E-01
603	1.227E+01	644	1.088E+01	685	5.672E+00	726	2.159E+00	767	7.274E-01
604	1.231E+01	645	1.076E+01	686	5.566E+00	727	2.104E+00	768	7.051E-01
605	1.240E+01	646	1.064E+01	687	5.439E+00	728	2.045E+00	769	6.888E-01
606	1.244E+01	647	1.052E+01	688	5.338E+00	729	1.993E+00	770	6.706E-01
607	1.249E+01	648	1.042E+01	689	5.217E+00	730	1.946E+00	771	6.523E-01
608	1.251E+01	649	1.028E+01	690	5.119E+00	731	1.903E+00	772	6.355E-01
609	1.255E+01	650	1.016E+01	691	4.994E+00	732	1.843E+00	773	6.191E-01
610	1.257E+01	651	1.004E+01	692	4.894E+00	733	1.795E+00	774	6.092E-01
611	1.260E+01	652	9.945E+00	693	4.781E+00	734	1.745E+00	775	5.870E-01
612	1.262E+01	653	9.785E+00	694	4.675E+00	735	1.700E+00	776	5.722E-01
613	1.262E+01	654	9.658E+00	695	4.568E+00	736	1.655E+00	777	5.576E-01
614	1.265E+01	655	9.529E+00	696	4.476E+00	737	1.611E+00	778	5.450E-01
615	1.265E+01	656	9.414E+00	697	4.363E+00	738	1.566E+00	779	5.379E-01
616	1.266E+01	657	9.268E+00	698	4.280E+00	739	1.525E+00	780	5.389E-01
617	1.262E+01	658	9.121E+00	699	4.164E+00	740	1.488E+00		
618	1.262E+01	659	9.011E+00	700	4.077E+00	741	1.445E+00		
619	1.261E+01	660	8.870E+00	701	3.981E+00	742	1.409E+00		
620	1.261E+01	661	8.739E+00	702	3.893E+00	743	1.372E+00		
621	1.256E+01	662	8.611E+00	703	3.808E+00	744	1.331E+00		
622	1.253E+01	663	8.464E+00	704	3.722E+00	745	1.301E+00		
623	1.249E+01	664	8.353E+00	705	3.621E+00	746	1.267E+00		
624	1.246E+01	665	8.198E+00	706	3.544E+00	747	1.235E+00		
625	1.241E+01	666	8.068E+00	707	3.458E+00	748	1.204E+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**

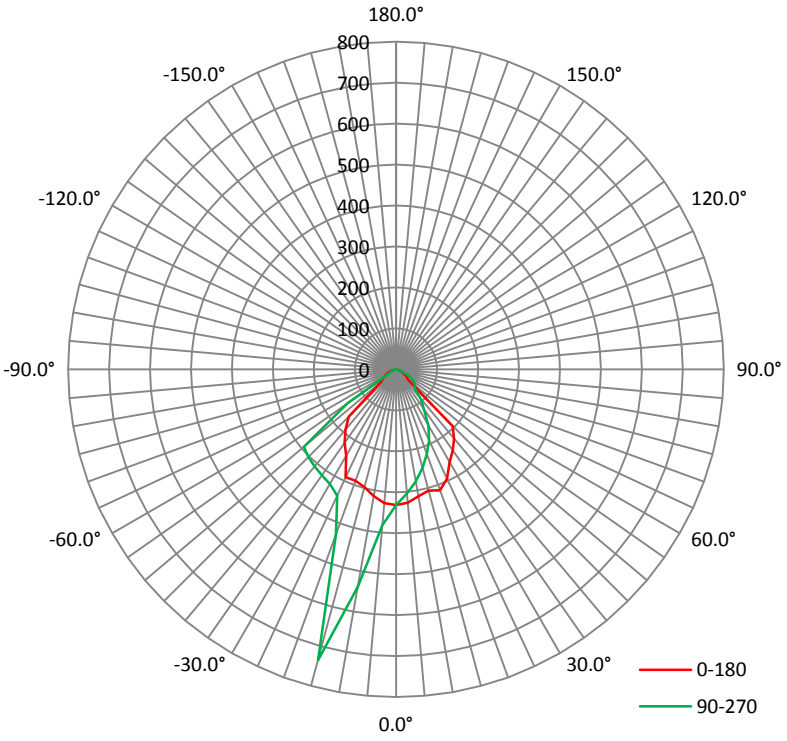
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60	0.1135	12.47	0.9146

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
625.468	50.17	734.7	1.19	0.81

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	91.3	79.3	18.2	73.3	65.5
Field Angle (10% I_{max}):	113.2	112.0	99.5	111.0	108.9

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0°	331	331	331	331	331	331	331	331
1°	331	334	336	338	338	337	335	334
2°	331	336	342	345	346	343	339	335
3°	331	339	347	354	355	350	343	337
4°	329	340	353	364	366	358	347	338
5°	328	340	357	375	381	367	351	339
6°	326	340	359	385	399	376	355	339
7°	323	338	358	391	417	386	358	339
8°	320	335	356	394	444	395	360	338
9°	317	332	353	393	485	405	361	336
10°	314	329	350	389	539	416	362	335
11°	310	326	347	384	595	427	362	334
12°	307	324	344	379	636	439	362	334
13°	304	322	342	376	665	457	363	333
14°	300	320	341	375	698	483	365	332
15°	297	318	340	377	735	518	370	332
16°	295	317	342	386	731	551	381	333
17°	293	317	345	405	659	559	398	337
18°	291	317	351	434	559	523	424	344
19°	289	320	361	478	479	463	453	355
20°	289	323	378	514	428	418	463	371
21°	289	328	401	494	395	389	439	388
22°	291	334	421	424	373	370	396	381
23°	292	337	407	376	357	356	364	352
24°	293	334	366	354	347	346	347	331
25°	291	324	340	342	340	340	337	318
26°	275	306	326	334	334	334	330	311
27°	262	294	318	329	330	330	325	306
28°	255	287	312	325	327	327	322	302
29°	249	282	308	321	325	324	319	298
30°	243	279	305	319	322	322	316	295
31°	238	275	302	317	320	320	314	293
32°	233	272	299	315	319	319	311	290
33°	228	269	297	313	317	317	310	288
34°	223	265	295	311	316	316	308	286
35°	218	262	292	309	315	315	306	283
36°	213	258	290	308	314	314	304	280
37°	208	255	288	306	313	312	303	278
38°	203	251	285	305	312	311	301	275
39°	197	248	283	303	310	310	299	272
40°	192	244	281	301	309	308	297	269
41°	186	239	278	300	308	307	295	266
42°	181	235	275	298	307	306	293	263
43°	175	231	273	296	305	304	291	260
44°	169	226	270	294	304	303	289	257
45°	163	222	267	292	303	301	287	253
46°	142	217	264	290	301	300	284	250
47°	80	212	260	288	299	298	282	246
48°	55	207	257	286	298	296	279	242
49°	51	130	253	283	295	294	277	238

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
50°	47	61	250	281	294	292	274	183
51°	43	51	246	278	291	290	271	70
52°	42	43	194	275	289	287	263	54
53°	41	35	83	271	287	284	161	41
54°	40	33	63	183	269	203	51	28
55°	39	32	44	65	144	65	41	27
56°	37	31	25	47	41	26	31	26
57°	36	30	24	33	29	23	21	25
58°	34	29	23	19	17	20	20	24
59°	33	28	22	18	16	17	19	23
60°	31	27	21	17	15	16	18	22
61°	30	25	20	17	15	15	17	21
62°	28	24	19	16	14	15	17	20
63°	27	23	18	15	14	14	16	19
64°	25	22	17	14	13	13	15	18
65°	23	20	16	14	12	12	14	17
66°	22	19	15	13	11	12	13	16
67°	20	18	15	12	11	11	12	15
68°	19	17	14	11	10	10	12	14
69°	18	15	13	11	9	10	11	13
70°	16	14	12	10	9	9	10	12
71°	15	13	11	9	8	8	9	11
72°	14	12	10	8	8	8	9	10
73°	13	11	9	8	7	7	8	10
74°	12	10	9	7	7	7	7	9
75°	11	9	8	7	6	6	7	8
76°	10	8	7	6	5	6	6	7
77°	9	8	6	5	5	5	6	7
78°	8	7	6	5	4	5	5	6
79°	7	6	5	4	4	4	5	5
80°	6	5	5	4	4	4	4	5
81°	5	5	4	3	3	3	4	4
82°	5	4	3	3	3	3	3	4
83°	4	3	3	3	2	2	3	3
84°	3	3	2	2	2	2	2	3
85°	3	2	2	2	2	2	2	2
86°	2	2	2	1	1	1	1	2
87°	1	1	1	1	1	1	1	1
88°	1	1	1	1	0	1	1	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

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	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	1	0	0	0	0	0	0
157°	0	1	1	0	0	0	0	0
158°	1	1	1	1	0	0	0	0
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	0
171°	1	1	1	1	1	1	1	0
172°	0	1	1	1	1	1	1	0
173°	0	1	1	1	1	1	1	0
174°	0	1	1	1	1	0	0	0
175°	0	0	1	1	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

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0°	331	331	331	331	331	331	331	331
1°	331	329	327	326	325	326	327	329
2°	330	326	323	321	320	320	323	326
3°	329	323	319	316	315	315	318	323
4°	328	320	315	311	310	310	314	320
5°	327	318	311	306	305	305	310	317
6°	325	315	307	302	300	301	305	313
7°	323	312	303	297	294	296	301	310
8°	320	309	299	292	289	291	296	306
9°	317	305	295	287	284	286	292	302
10°	315	302	290	282	278	280	287	299
11°	313	298	286	277	273	275	283	295
12°	311	294	281	272	267	269	278	291
13°	310	291	277	266	261	264	273	286
14°	308	288	273	261	255	258	268	282
15°	307	284	268	256	250	252	263	278
16°	306	281	263	250	244	246	257	274
17°	305	278	259	245	238	241	252	270
18°	307	276	254	239	232	235	247	266
19°	310	274	250	234	226	229	242	262
20°	314	273	246	229	220	223	236	258
21°	322	272	242	223	214	217	231	254
22°	331	273	239	218	208	212	226	251
23°	334	274	236	213	203	206	221	249
24°	317	273	233	208	197	201	216	248
25°	294	268	230	203	191	195	212	245
26°	284	255	225	198	185	188	206	238
27°	276	244	215	193	178	179	196	226
28°	271	236	206	186	172	170	188	216
29°	266	230	198	178	166	162	179	208
30°	262	224	191	170	159	155	172	202
31°	258	219	185	162	150	148	164	195
32°	254	213	179	155	142	141	157	189
33°	250	208	173	148	134	134	151	182
34°	246	203	167	141	126	126	144	176
35°	242	197	161	134	119	119	137	170
36°	238	192	155	127	112	113	130	164
37°	234	187	149	120	107	108	123	157
38°	230	181	143	113	102	103	115	151
39°	225	176	137	107	99	99	109	145
40°	220	170	130	101	96	96	104	138
41°	216	165	123	97	93	93	99	131
42°	211	159	117	94	91	91	95	124
43°	206	153	110	91	89	83	92	117
44°	201	147	103	82	72	66	82	110
45°	196	123	82	64	65	64	63	89
46°	190	98	63	61	64	64	60	67
47°	144	74	55	60	63	63	59	53
48°	98	53	54	60	63	62	58	52
49°	52	45	53	59	62	61	57	51

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
50°	38	44	52	58	61	60	56	50
51°	37	43	50	57	60	59	55	49
52°	36	42	49	55	59	58	54	47
53°	34	41	48	54	57	57	53	46
54°	33	39	47	53	56	55	51	45
55°	32	38	45	51	54	54	50	43
56°	31	37	44	49	52	52	48	42
57°	30	35	42	48	50	50	46	40
58°	29	34	40	45	48	48	44	38
59°	27	32	38	43	46	45	42	37
60°	26	31	36	41	43	43	40	35
61°	25	29	34	39	41	41	38	33
62°	23	28	33	37	39	38	36	31
63°	22	26	31	34	36	36	33	29
64°	21	24	29	32	34	34	31	28
65°	19	23	27	30	32	31	29	26
66°	18	21	25	28	29	29	27	24
67°	17	20	23	26	27	27	25	22
68°	16	18	21	24	25	25	23	21
69°	15	17	20	22	23	23	22	19
70°	14	16	18	20	21	21	20	18
71°	13	15	17	18	19	19	18	16
72°	11	13	15	17	18	18	17	15
73°	10	12	14	15	16	16	15	14
74°	10	11	13	14	15	15	14	13
75°	9	10	12	13	13	13	13	11
76°	8	9	10	11	12	12	11	10
77°	7	8	9	10	10	11	10	9
78°	6	7	8	9	9	9	9	8
79°	6	6	7	8	8	8	8	7
80°	5	6	7	7	7	7	7	6
81°	4	5	6	6	6	6	6	6
82°	4	4	5	5	6	6	5	5
83°	3	3	4	5	5	5	4	4
84°	2	3	3	4	4	4	4	3
85°	2	2	3	3	3	3	3	2
86°	1	2	2	2	2	2	2	2
87°	1	1	1	1	2	2	1	1
88°	0	0	1	1	1	1	1	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.)

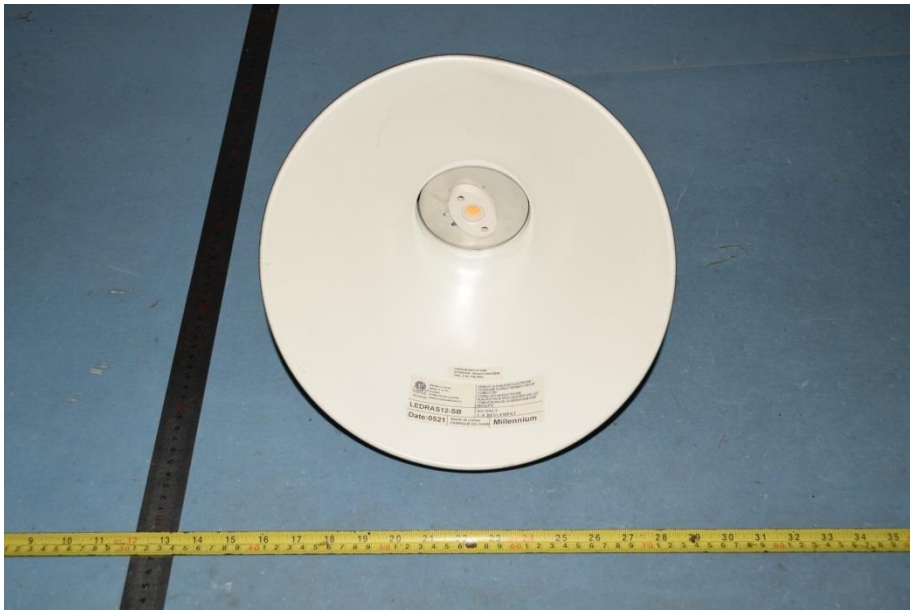
C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
150°	0	0	0	0	0	0	0	0
151°	0	0	0	0	0	0	0	0
152°	0	0	0	0	0	0	0	0
153°	0	0	0	0	0	0	0	0
154°	0	0	0	0	0	0	0	0
155°	0	0	0	0	0	0	0	0
156°	0	0	0	0	0	0	0	0
157°	0	0	0	0	0	0	0	0
158°	0	0	0	0	0	0	0	0
159°	0	0	0	0	0	0	0	0
160°	0	0	0	0	0	0	0	0
161°	0	0	0	0	0	0	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	7.9	1.27
5-10	23.9	3.82
10-15	40.0	6.40
15-20	54.9	8.78
20-25	63.4	10.14
25-30	65.9	10.53
30-35	69.1	11.04
35-40	71.2	11.38
40-45	71.4	11.42
45-50	62.5	9.98
50-55	43.8	7.01
55-60	16.3	2.60
60-65	12.3	1.97
65-70	9.2	1.47
70-75	6.4	1.03
75-80	4.0	0.64
80-85	2.1	0.33
85-90	0.5	0.09
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	0.01
150-155	0.1	0.01
155-160	0.1	0.02
160-165	0.1	0.01
165-170	0.0	0.00
170-175	0.0	0.01
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	7.9	1.27
0-10	31.9	5.09
0-15	71.9	11.49
0-20	126.8	20.27
0-25	190.2	30.41
0-30	256.1	40.94
0-35	325.1	51.98
0-40	396.3	63.36
0-45	467.7	74.78
0-50	530.2	84.76
0-55	574.0	91.77
0-60	590.3	94.37
0-65	602.6	96.34
0-70	611.8	97.81
0-75	618.2	98.84
0-80	622.2	99.48
0-85	624.3	99.81
0-90	624.8	99.90
0-95	624.8	99.90
0-100	624.8	99.90
0-105	624.8	99.90
0-110	624.8	99.90
0-115	624.9	99.90
0-120	624.9	99.90
0-125	624.9	99.91
0-130	624.9	99.91
0-135	625.0	99.92
0-140	625.0	99.93
0-145	625.1	99.94
0-150	625.2	99.95
0-155	625.2	99.96
0-160	625.3	99.98
0-165	625.4	99.99
0-170	625.4	99.99
0-175	625.5	100.00
0-180	625.5	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.
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**********END OF REPORT**********