

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

Soraa, Inc

6500 Kaiser Dr. Fremont, California 94555, USA

Test Model: SR111-12-36D-927-03

Report Type:	Electrical and Photometric tests including: Luminous Flux, Color, Luminous Intensity Distribution, Spatial Non-uniformity of Chromaticity
Test Engineer:	Daniel Duan <i>Daniel Duan</i>
Report Number:	R2DG151106051-10A1-N1
Test Date:	2015-11-10 to 2015-11-11
Report Date:	2015-11-11
Reviewed By:	Jeanne Han/Safety Manager <i>Jeanne Han</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008
Test Facility:	Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.

1. Product Description

General Information:

One sample was received on 2015-11-06 and used for testing.

Model Tested: SR111-12-36D-927-03
 Manufacturer: Soraa, Inc
 Brand Name: SORAA VIVID
 Product Designation: LED AR111
 Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 12 V AC 50/60Hz
 Rated Power: 12.5 W
 Nominal CCT: 2700K
 Nominal Lumen Output: 575 lm

2. Standards Used

- IESNA 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

3. Description of Test Equipment

Device	Manufacturer	Model No	Serial No	Test Range	Calibration date	Calibration due date
2.0m integrating sphere	EVERFINE	R98	11010018	N/A	2014-12-27	2015-12-27
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2015-03-25	2016-03-24
Digital CC&CV DC Power Supply	EVERFINE	WY305	1101047	30V/5A	2015-03-05	2016-03-05
Temperature/humidity/clock	Victor	VC230	EE209	0~40°C0~90%	2013-04-01	2016-03-31
Standard Light Source	EVERFINE	D204	LSD090808	N/A	2015-09-17	2016-09-16
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010	1011001T	N/A	2015-03-05	2016-03-05
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2015-03-05	2016-03-05
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2015-03-05	2016-03-05
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2015-03-05	2016-03-05
Goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2015-03-20	2016-03-20
Thermal Meter	Victor	VC230	EE091	0~40°C0~90%	2013-04-01	2016-03-31
Standard Light Source	EVERFINE	D908	1012003	N/A	2015-05-15	2016-05-14

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) 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, spectrophotometer, and integrating sphere. The integrating sphere system is calibrated by standard 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 $U=2.3\%$ ($K=2$), 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 uncertainty of the luminous intensity is $U=2.82\%$ ($K=2$), at the 95% confidence level.

5. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Baseup**

Electrical Measurement

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
12.0	60	1.125	12.45	0.9222

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
695.1	2.9404	55.82	2717	-0.000521

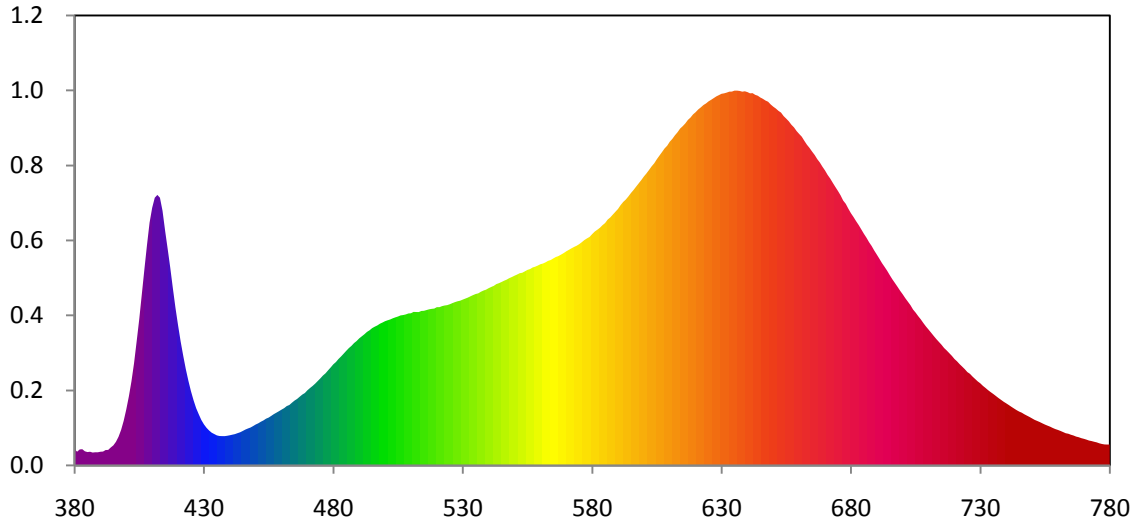
Chromaticity Coordinate

x	y	u	v	u'	v'
0.4576	0.4087	0.2619	0.3509	0.2619	0.5263

Color Rendering Index

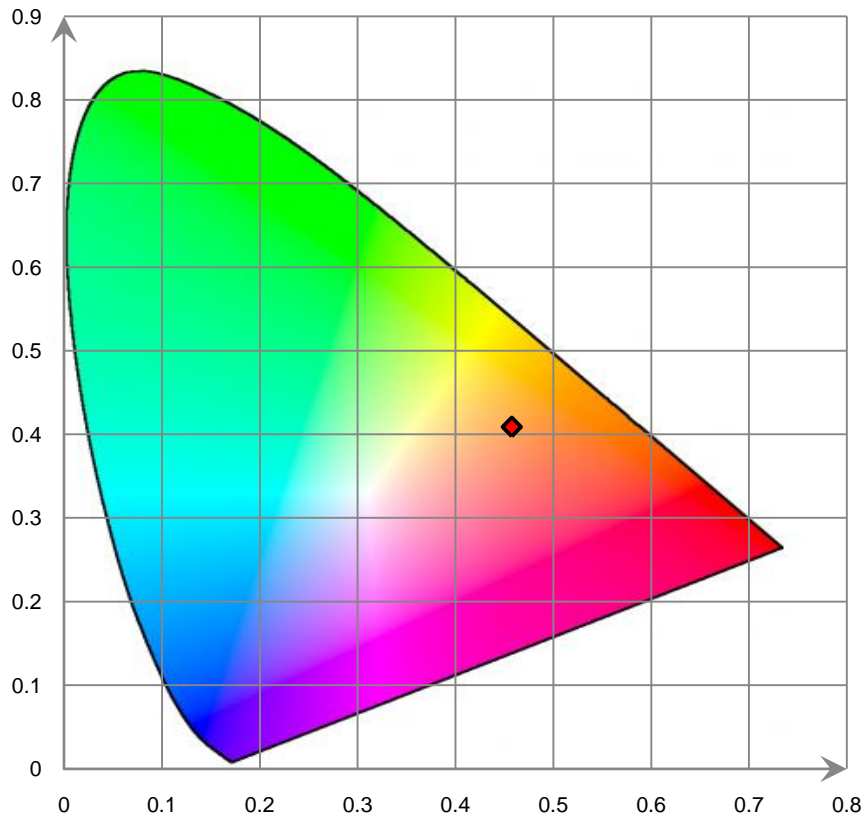
Ra			
95.9			
R1 95	R2 97	R3 98	R4 93
R5 94	R6 92	R7 99	R8 99
R9 98	R10 92	R11 89	R12 75
R13 95	R14 99	R15 98	

Relative Spectral Power Distribution

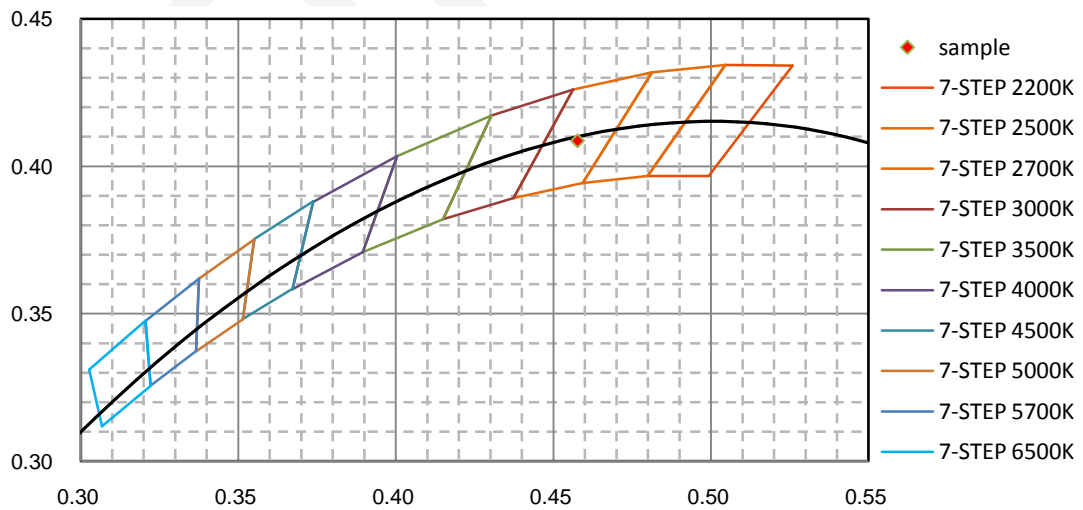


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	4.310E-02	465	1.730E-01	550	5.060E-01	635	9.995E-01	720	2.840E-01
385	3.580E-02	470	2.006E-01	555	5.215E-01	640	9.957E-01	725	2.490E-01
390	3.660E-02	475	2.324E-01	560	5.366E-01	645	9.812E-01	730	2.190E-01
395	5.360E-02	480	2.698E-01	565	5.521E-01	650	9.568E-01	735	1.907E-01
400	1.497E-01	485	3.058E-01	570	5.710E-01	655	9.249E-01	740	1.657E-01
405	3.897E-01	490	3.389E-01	575	5.901E-01	660	8.840E-01	745	1.438E-01
410	6.873E-01	495	3.663E-01	580	6.169E-01	665	8.370E-01	750	1.255E-01
415	6.259E-01	500	3.848E-01	585	6.464E-01	670	7.866E-01	755	1.090E-01
420	3.740E-01	505	3.973E-01	590	6.840E-01	675	7.319E-01	760	9.470E-02
425	1.979E-01	510	4.059E-01	595	7.266E-01	680	6.727E-01	765	8.200E-02
430	1.096E-01	515	4.124E-01	600	7.706E-01	685	6.180E-01	770	7.110E-02
435	8.020E-02	520	4.222E-01	605	8.166E-01	690	5.624E-01	775	6.160E-02
440	8.060E-02	525	4.299E-01	610	8.633E-01	695	5.077E-01	780	5.590E-02
445	9.200E-02	530	4.423E-01	615	9.047E-01	700	4.565E-01		
450	1.092E-01	535	4.572E-01	620	9.422E-01	705	4.076E-01		
455	1.277E-01	540	4.727E-01	625	9.710E-01	710	3.624E-01		
460	1.490E-01	545	4.893E-01	630	9.911E-01	715	3.220E-01		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **0.5 hour**

Test orientation: **Baesup**

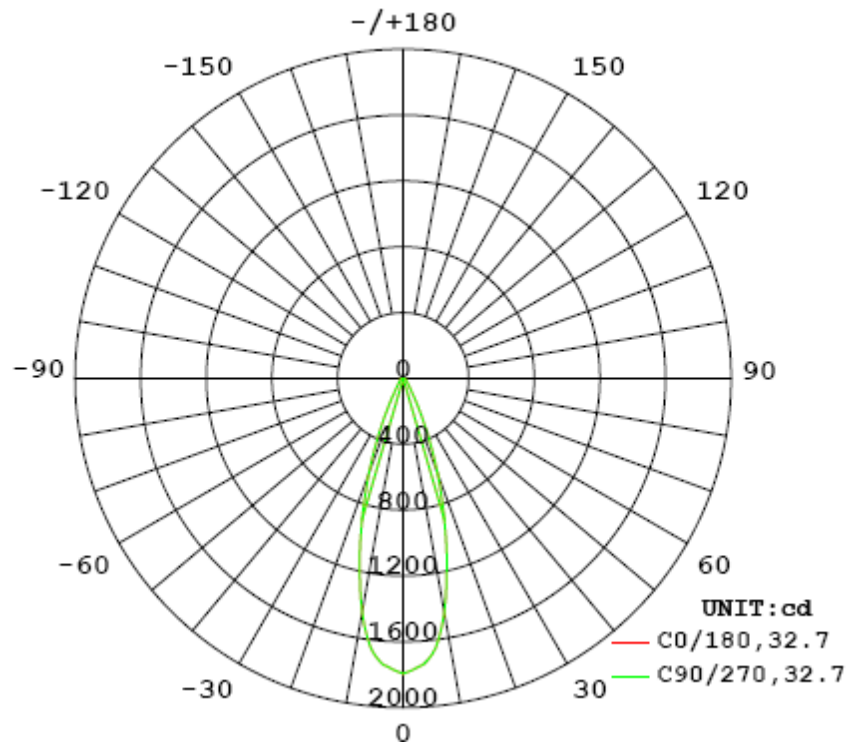
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
12.0	60	1.1640	12.46	0.8920

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
710.169	57.00	1792	0.54	0.54

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	32.7	32.7	32.7	32.7	32.7
Field Angle (10% I _{max}):	56.9	56.9	56.9	56.9	56.9

Luminous Intensity (cd) Distribution Data

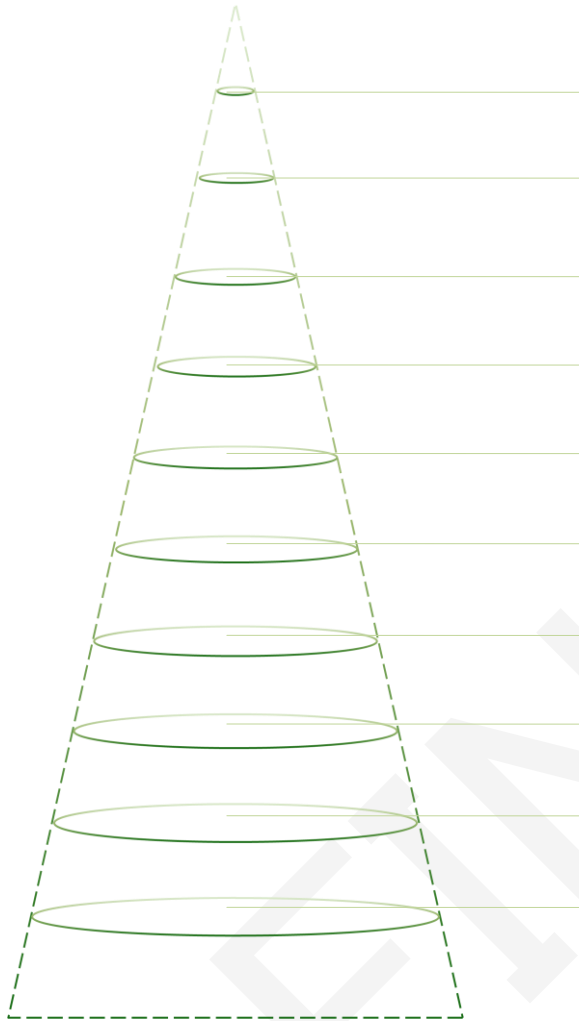
C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1792	1792	1792	1792	1792	1792	1792	1792
5.0°	1718	1718	1718	1718	1718	1718	1718	1718
10.0°	1443	1443	1443	1443	1443	1443	1443	1443
15.0°	1010	1010	1010	1010	1010	1010	1010	1010
20.0°	615	615	615	615	615	615	615	615
25.0°	311	311	311	311	311	311	311	311
30.0°	142	142	142	142	142	142	142	142
35.0°	76	76	76	76	76	76	76	76
40.0°	50	50	50	50	50	50	50	50
45.0°	38	38	38	38	38	38	38	38
50.0°	32	32	32	32	32	32	32	32
55.0°	26	26	26	26	26	26	26	26
60.0°	21	21	21	21	21	21	21	21
65.0°	17	17	17	17	17	17	17	17
70.0°	12	12	12	12	12	12	12	12
75.0°	8	8	8	8	8	8	8	8
80.0°	4	4	4	4	4	4	4	4
85.0°	1	1	1	1	1	1	1	1
90.0°	0	0	0	0	0	0	0	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	0	0	0	0	0	0	0
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1792	1792	1792	1792	1792	1792	1792	1792
5.0°	1718	1718	1718	1718	1718	1718	1718	1718
10.0°	1443	1443	1443	1443	1443	1443	1443	1443
15.0°	1010	1010	1010	1010	1010	1010	1010	1010
20.0°	615	615	615	615	615	615	615	615
25.0°	311	311	311	311	311	311	311	311
30.0°	142	142	142	142	142	142	142	142
35.0°	76	76	76	76	76	76	76	76
40.0°	50	50	50	50	50	50	50	50
45.0°	38	38	38	38	38	38	38	38
50.0°	32	32	32	32	32	32	32	32
55.0°	26	26	26	26	26	26	26	26
60.0°	21	21	21	21	21	21	21	21
65.0°	17	17	17	17	17	17	17	17
70.0°	12	12	12	12	12	12	12	12
75.0°	8	8	8	8	8	8	8	8
80.0°	4	4	4	4	4	4	4	4
85.0°	1	1	1	1	1	1	1	1
90.0°	0	0	0	0	0	0	0	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	0	0	0	0	0	0	0
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

Average Area Illumination Figure

Angle:32.7° Flux out:355.4lm



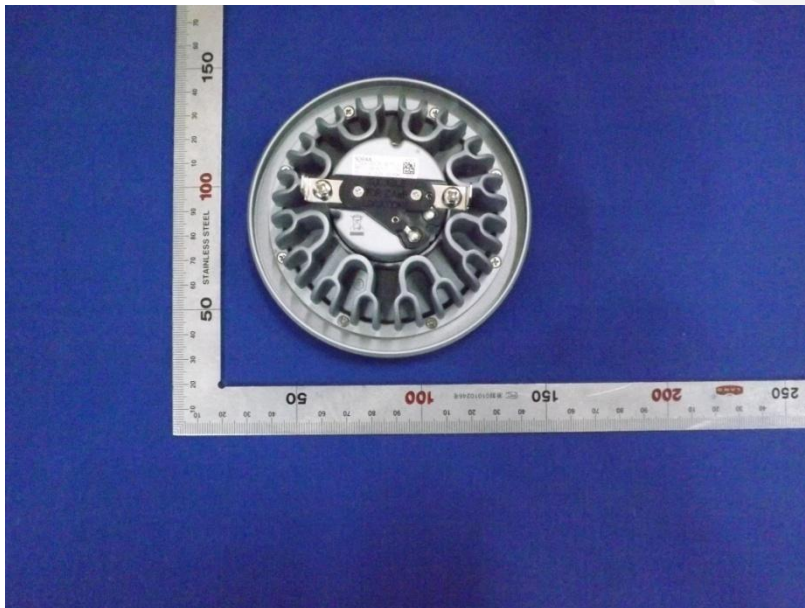
Height (m)	Diameter (cm)	E _{avg} (lx)	E _{max} (lx)
0.5	29.34	4842.0	7169.0
1.0	58.67	1210.0	1792.0
1.5	88.01	538.0	796.6
2.0	117.35	302.6	448.1
2.5	146.68	193.7	286.8
3.0	176.02	134.5	199.1
3.5	205.36	98.8	146.3
4.0	234.69	75.7	112.0
4.5	264.03	59.8	88.5
5.0	293.37	48.4	71.7

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	41.8	5.89
5-10	113.6	16.00
10-15	144.1	20.30
15-20	131.0	18.44
20-25	94.0	13.23
25-30	53.9	7.59
30-35	30.2	4.26
35-40	20.5	2.88
40-45	16.0	2.26
45-50	14.0	1.97
50-55	12.5	1.77
55-60	10.9	1.53
60-65	9.2	1.29
65-70	7.2	1.02
70-75	5.1	0.73
75-80	3.1	0.43
80-85	1.2	0.17
85-90	0.1	0.02
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	0.01
120-125	0.0	0.00
125-130	0.0	0.00
130-135	0.0	0.01
135-140	0.1	0.01
140-145	0.2	0.02
145-150	0.2	0.03
150-155	0.3	0.04
155-160	0.3	0.04
160-165	0.2	0.03
165-170	0.1	0.02
170-175	0.1	0.01
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	41.8	5.89
0-10	155.5	21.89
0-15	299.6	42.19
0-20	430.6	60.63
0-25	524.6	73.86
0-30	578.5	81.45
0-35	608.7	85.71
0-40	629.1	88.59
0-45	645.2	90.85
0-50	659.2	92.82
0-55	671.7	94.59
0-60	682.6	96.12
0-65	691.8	97.41
0-70	699.0	98.43
0-75	704.2	99.16
0-80	707.2	99.59
0-85	708.5	99.76
0-90	708.6	99.78
0-95	708.6	99.78
0-100	708.6	99.78
0-105	708.6	99.78
0-110	708.6	99.78
0-115	708.6	99.78
0-120	708.6	99.79
0-125	708.7	99.79
0-130	708.7	99.79
0-135	708.7	99.80
0-140	708.8	99.81
0-145	709.0	99.83
0-150	709.2	99.86
0-155	709.5	99.90
0-160	709.7	99.94
0-165	709.9	99.97
0-170	710.1	99.99
0-175	710.1	100.00
0-180	710.2	100.00

6. Product Photo



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