

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

Soraa Inc.

6500 Kaiser Drive, Fremont, CA 94555

Test Model: SP30S-18-25D-930-03

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:	R2DG150429051-10A1
Test Date:	2015-05-05 to 2015-05-06
Report Date:	2015-05-08
Reviewed By:	Jeanne Han/Safety Manager <i>Jeanne Han</i>
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Test Facility:	Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.
Accreditation:	The NVLAP Lab Code is 200707-0.

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1. Product Description

General Information:

Two samples were received on 2015-04-29. One was tested in integrating sphere and the other was tested in goniophotometer.

Model Tested: SP30S-18-25D-930-03
 Manufacturer: Soraa Inc.
 Brand Name: Soraa
 Product Designation: LED Lamp
 Burning Time Before Test: 0 hour(For New Products)

Rated Values:

Rated Voltage/Frequency: AC 100-120V 60Hz
 Rated Power: 18.5 W
 Nominal CCT: 3000K
 Nominal Lumen Output: 1000 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	2015-03-04	2016-03-04
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	2014-08-05	2015-08-05
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010	1011001T	N/A	2015-03-05	2016-03-05
AC Power Supply	EVERFINE	VPS1060 PWM	1101006	0-150V, 0-300V	2015-03-12	2016-03-12
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	2015-03-04	2016-03-04
Thermal Meter	Victor	VC230	EE091	0~40°C0~90%	2013-04-01	2016-03-31
Standard Light Source	EVERFINE	D908	1012004	N/A	2014-07-31	2015-07-31

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 $U=2.1\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=32\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.0(K=2)$, 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: **Base up**

Electrical Measurement

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.0	60.0	0.1544	18.17	0.9807

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
1020.3	4.2163	56.16	2960	2.24E-04

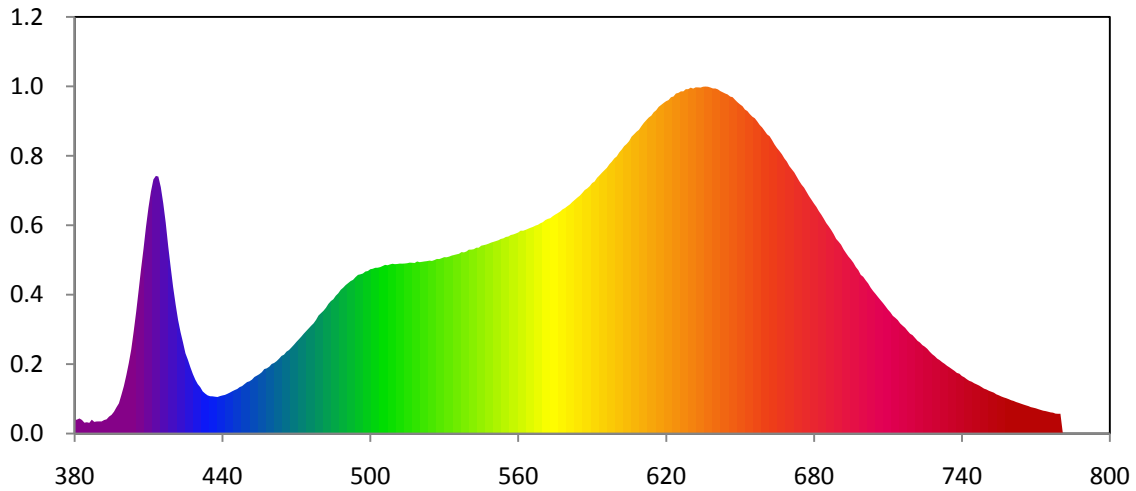
Chromaticity Coordinate

x	y	u	v	u'	v'
0.4402	0.4057	0.2519	0.3483	0.2519	0.5225

Color Rendering Index

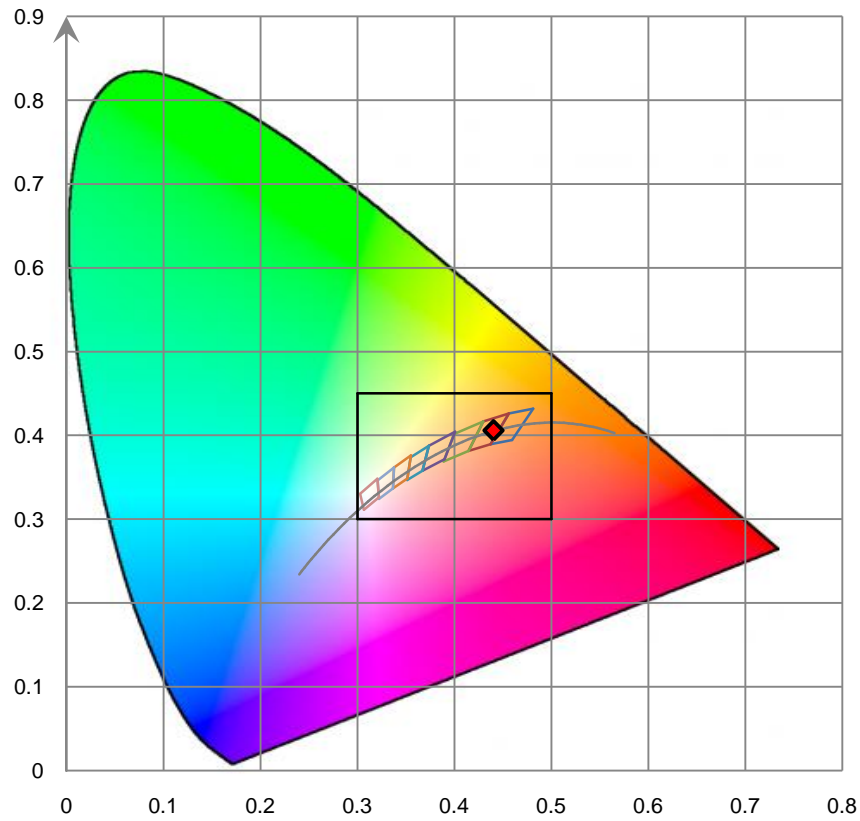
Ra			
95.1			
R1 94	R2 96	R3 97	R4 93
R5 93	R6 91	R7 98	R8 99
R9 98	R10 90	R11 88	R12 76
R13 94	R14 99	R15 97	

Relative Spectral Power Distribution

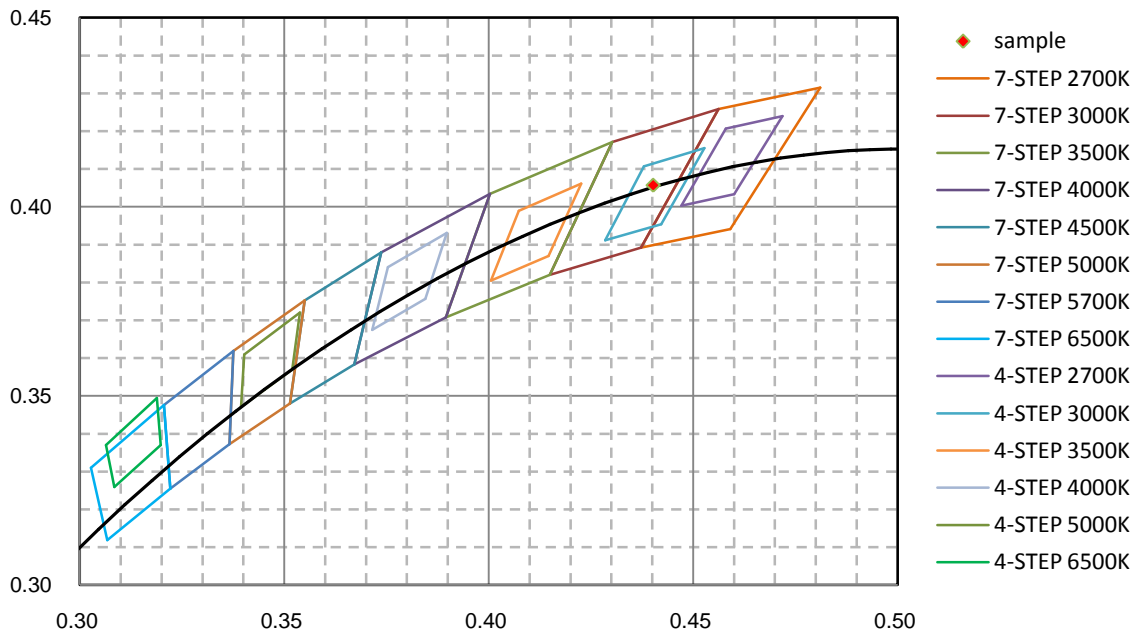


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	8.010E-01	465	4.752E+00	550	1.155E+01	635	2.088E+01	720	5.926E+00
385	6.812E-01	470	5.518E+00	555	1.184E+01	640	2.078E+01	725	5.228E+00
390	7.337E-01	475	6.332E+00	560	1.211E+01	645	2.042E+01	730	4.513E+00
395	1.124E+00	480	7.252E+00	565	1.239E+01	650	1.982E+01	735	3.985E+00
400	2.855E+00	485	8.087E+00	570	1.273E+01	655	1.908E+01	740	3.466E+00
405	7.321E+00	490	8.940E+00	575	1.319E+01	660	1.822E+01	745	3.030E+00
410	1.361E+01	495	9.555E+00	580	1.370E+01	665	1.719E+01	750	2.655E+00
415	1.484E+01	500	9.895E+00	585	1.432E+01	670	1.611E+01	755	2.304E+00
420	8.829E+00	505	1.009E+01	590	1.508E+01	675	1.499E+01	760	2.008E+00
425	4.833E+00	510	1.020E+01	595	1.586E+01	680	1.385E+01	765	1.746E+00
430	2.977E+00	515	1.026E+01	600	1.669E+01	685	1.268E+01	770	1.521E+00
435	2.249E+00	520	1.032E+01	605	1.761E+01	690	1.156E+01	775	1.317E+00
440	2.295E+00	525	1.040E+01	610	1.851E+01	695	1.049E+01	780	1.193E+00
445	2.621E+00	530	1.062E+01	615	1.935E+01	700	9.437E+00	785	0.000E+00
450	3.100E+00	535	1.079E+01	620	2.001E+01	705	8.407E+00	790	0.000E+00
455	3.578E+00	540	1.107E+01	625	2.051E+01	710	7.472E+00	795	0.000E+00
460	4.189E+00	545	1.131E+01	630	2.083E+01	715	6.630E+00	800	0.000E+00

CIE 1931 x y Chromaticity Diagram



7-Step & 4-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **2.0 hours**

Test orientation: **Base up**

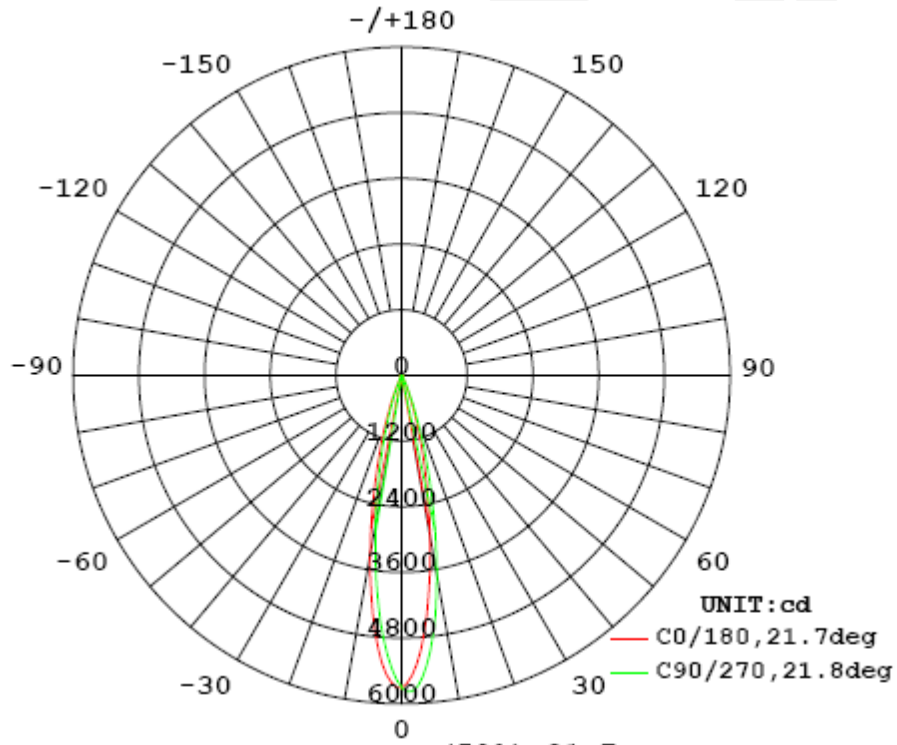
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60.0	0.1547	18.3	0.9859

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	CBCP (cd)	S/MH (C0/180)	S/MH (C90/270)
1061.27	57.99	5702	0.39	0.33

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	21.7	21.8	21.8	21.7	21.75
Field Angle (10% I _{max}):	40.8	40.4	40.3	40.9	40.60

Luminous Intensity (cd) Distribution Data

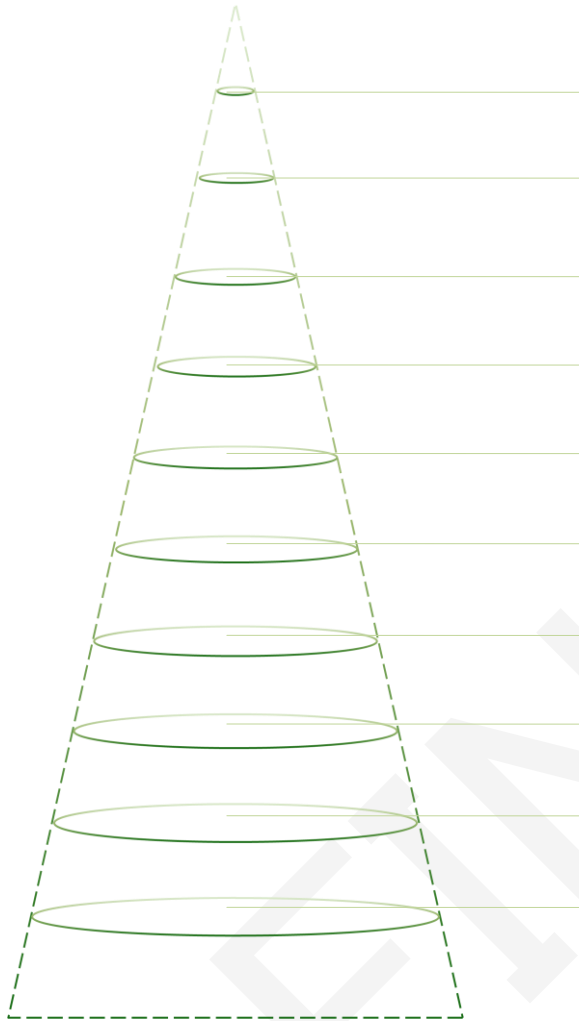
C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	5702	5702	5702	5702	5702	5702	5702	5702
5.0°	4995	4803	4661	4566	4495	4495	4543	4656
10.0°	3323	3113	2931	2805	2747	2764	2816	2913
15.0°	1735	1611	1479	1371	1344	1364	1412	1457
20.0°	675	599	541	498	483	496	538	563
25.0°	189	163	139	129	125	128	141	152
30.0°	68	64	61	60	59	60	61	62
35.0°	47	46	45	44	44	44	45	46
40.0°	37	37	36	35	35	36	35	36
45.0°	33	32	31	30	30	30	30	31
50.0°	27	27	26	26	26	26	26	26
55.0°	24	23	23	22	22	22	22	23
60.0°	20	19	19	18	18	18	18	19
65.0°	16	15	15	14	14	14	15	15
70.0°	12	11	11	11	11	10	11	11
75.0°	8	7	6	6	6	6	6	7
80.0°	4	3	3	3	3	3	3	3
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°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	0	0	0	0	0
160.0°	0	0	0	0	0	0	0	0
165.0°	0	0	0	0	0	0	0	0
170.0°	0	0	0	0	0	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	5702	5702	5702	5702	5702	5702	5702	5702
5.0°	4725	4908	5088	5234	5305	5301	5206	5081
10.0°	2982	3223	3429	3607	3708	3699	3569	3390
15.0°	1496	1648	1778	1885	1963	1977	1899	1772
20.0°	568	637	674	722	760	783	767	689
25.0°	174	183	194	209	219	224	221	197
30.0°	64	69	72	76	77	77	75	71
35.0°	46	47	49	51	50	50	50	48
40.0°	37	37	38	39	39	39	38	38
45.0°	31	32	32	32	32	32	32	32
50.0°	27	27	27	27	28	28	27	27
55.0°	24	24	24	24	24	24	24	24
60.0°	19	19	20	20	20	20	20	20
65.0°	15	16	16	16	16	16	16	16
70.0°	11	12	12	12	13	13	12	12
75.0°	7	8	8	9	9	9	8	8
80.0°	4	4	4	4	5	5	4	4
85.0°	1	1	2	2	2	2	2	2
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°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	0	0	0	0	0
160.0°	0	0	0	0	0	0	0	0
165.0°	0	0	0	0	0	0	0	0
170.0°	0	0	0	0	0	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

Average Area Illumination Figure

Angle: 21.75°. Flux out: 470.3 lm.



Height (m)	Diameter (cm)	E _{avg} (lx)	E _{max} (lx)
0.5	19.2	15847.0	23130.0
1.0	38.4	3962.0	5782.0
1.5	57.6	1761.0	2570.0
2.0	76.8	990.4	1446.0
2.5	96.1	633.9	925.2
3.0	115.3	440.2	642.5
3.5	134.5	323.4	472.0
4.0	153.7	247.6	361.4
4.5	172.9	195.6	285.6
5.0	192.1	158.5	231.3

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	126.1	11.88
5-10	283.8	26.75
10-15	276.3	26.03
15-20	174.8	16.47
20-25	73.5	6.93
25-30	27.0	2.54
30-35	16.3	1.54
35-40	13.8	1.30
40-45	12.6	1.19
45-50	11.7	1.09
50-55	10.9	1.03
55-60	9.9	0.93
60-65	8.4	0.79
65-70	6.8	0.64
70-75	4.9	0.46
75-80	2.9	0.28
80-85	1.3	0.12
85-90	0.3	0.03
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	0.00
125-130	0.0	0.00
130-135	0.0	0.00
135-140	0.0	0.00
140-145	0.0	0.00
145-150	0.0	0.00
150-155	0.0	0.00
155-160	0.0	0.00
160-165	0.0	0.00
165-170	0.0	0.00
170-175	0.0	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	126.1	11.88
0-10	410.0	38.63
0-15	686.3	64.66
0-20	861.0	81.13
0-25	934.6	88.06
0-30	961.5	90.60
0-35	977.8	92.14
0-40	991.7	93.44
0-45	1004.2	94.63
0-50	1015.9	95.72
0-55	1026.8	96.75
0-60	1036.6	97.68
0-65	1045.0	98.47
0-70	1051.8	99.11
0-75	1056.7	99.57
0-80	1059.6	99.85
0-85	1061.0	99.97
0-90	1061.3	100.00
0-95	1061.3	100.00
0-100	1061.3	100.00
0-105	1061.3	100.00
0-110	1061.3	100.00
0-115	1061.3	100.00
0-120	1061.3	100.00
0-125	1061.3	100.00
0-130	1061.3	100.00
0-135	1061.3	100.00
0-140	1061.3	100.00
0-145	1061.3	100.00
0-150	1061.3	100.00
0-155	1061.3	100.00
0-160	1061.3	100.00
0-165	1061.3	100.00
0-170	1061.3	100.00
0-175	1061.3	100.00
0-180	1061.3	100.00

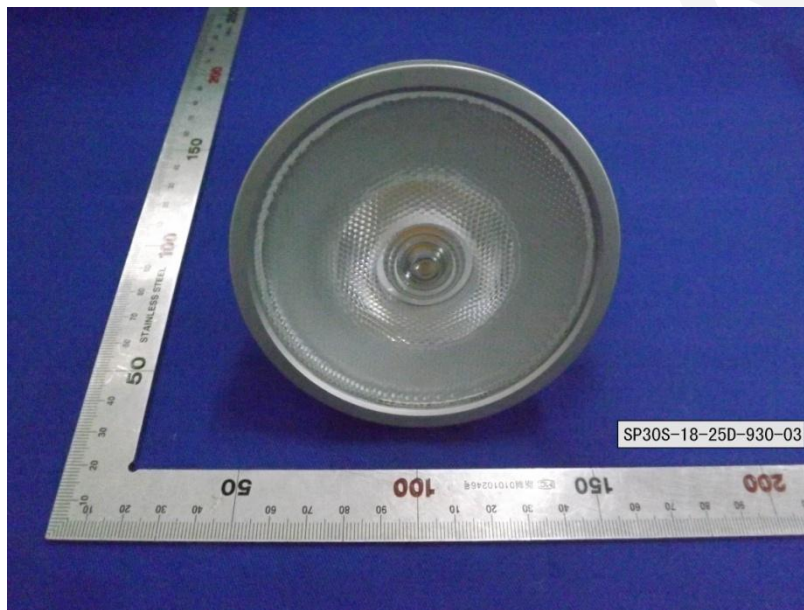
Color Spatial Uniformity

Average Weighted
u': 0.2516, v': 0.5223

$\gamma \setminus C0-180$	u'	v'	$Du'v'$	$\gamma \setminus C90-270$	u'	v'	$Du'v'$
-20	0.2547	0.5245	0.0038	-20	0.2544	0.5236	0.0031
-15	0.2530	0.5237	0.0020	-15	0.2517	0.5222	0.0001
-10	0.2523	0.5234	0.0013	-10	0.2517	0.5227	0.0004
-5	0.2526	0.5234	0.0015	-5	0.2520	0.5231	0.0009
0	0.2519	0.5229	0.0007	0	0.2516	0.5229	0.0006
5	0.2516	0.5223	0.0000	5	0.2521	0.5228	0.0007
10	0.2505	0.5210	0.0017	10	0.2516	0.5222	0.0001
15	0.2484	0.5189	0.0047	15	0.2511	0.5214	0.0010
20	0.2488	0.5186	0.0046	20	0.2533	0.5229	0.0018

FINAL

6. Product Photo



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