

# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

**Soraa, Inc**

6500 Kaiser Dr. Fremont, California 94555, USA

**Test Model: SP20-11-25D-927-03**

<b>Report Type:</b>	Electrical and Photometric tests including: Luminous Flux, Color, Luminous Intensity Distribution, Spatial Non-uniformity of Chromaticity
<b>Test Engineer:</b>	Daniel Duan <i>Daniel Duan</i>
<b>Report Number:</b>	R2DG151014050-10A1
<b>Test Date:</b>	2015-10-14 to 2015-10-17
<b>Report Date:</b>	2016-05-20
<b>Reviewed By:</b>	Jeanne Han/Safety Manager <i>Jeanne Han</i>
<b>Prepared By:</b>	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
<b>Test Facility:</b>	Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.
<b>Accreditation:</b>	The NVLAP Lab Code is 200707-0.

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## 1. Product Description

### General Information:

Two samples were received on 2015-10-14 One was tested in integrating sphere and the other was tested in goniophotometer.

Model Tested: SP20-11-25D-927-03  
 Manufacturer: Soraa, Inc  
 Brand Name: SORAA VIVID  
 Product Designation: Directional LED Lamp  
 Burning Time Before Test: 0hour(For New Products)

### Rated Values:

Rated Voltage/Frequency: AC 120V 60 Hz  
 Rated Power: 10.8 W  
 Nominal CCT: 2700K  
 Nominal Lumen Output: 500lm

## 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	R98	2015-11-09	2016-11-08
High accuracy array spectroradiometer	EVERFINE	HAAS-2000	1012016T	380-780nm	2016-03-10	2017-03-09
Digital Power Meter	EVERFINE	PF2010A	1011004	600V/20A	2015-07-24	2016-07-23
Digital CC&CV DC Power Supply	EVERFINE	WY305-V1	1101047	30V/5A	2015-07-27	2016-07-26
Temperature/humidity/clock	Victor	VC230	EE023	0~40°C0~90%	2016-03-21	2017-03-20
Standard Light Source	SENSING	N/A	LSD090808	N/A	2015-09-25	2016-09-24
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010-YF	1011001T	30V/5A	2016-03-04	2017-03-03
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2016-03-04	2017-03-03
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2016-03-04	2017-03-03
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2016-03-04	2017-03-03
Goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2016-03-10	2017-03-09
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C;-20°C~60°C	2016-03-21	2017-03-20
Standard Light Source	EVERFINE	D908	1012003	N/A	2015-09-08	2016-09-07

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.

$4\pi$  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  $U=1.8\%$  ( $K=2$ ), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is  $U=20\text{K}$  ( $K=2$ ), at the 95% confidence level. The uncertainty of the CRI is  $U=1.8(K=2)$ , 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: **Base up**

#### Electrical Measurement

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.1	59.98	0.09287	10.46	0.9381

#### Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
555.54	2.346	53.11	2693	-0.000305

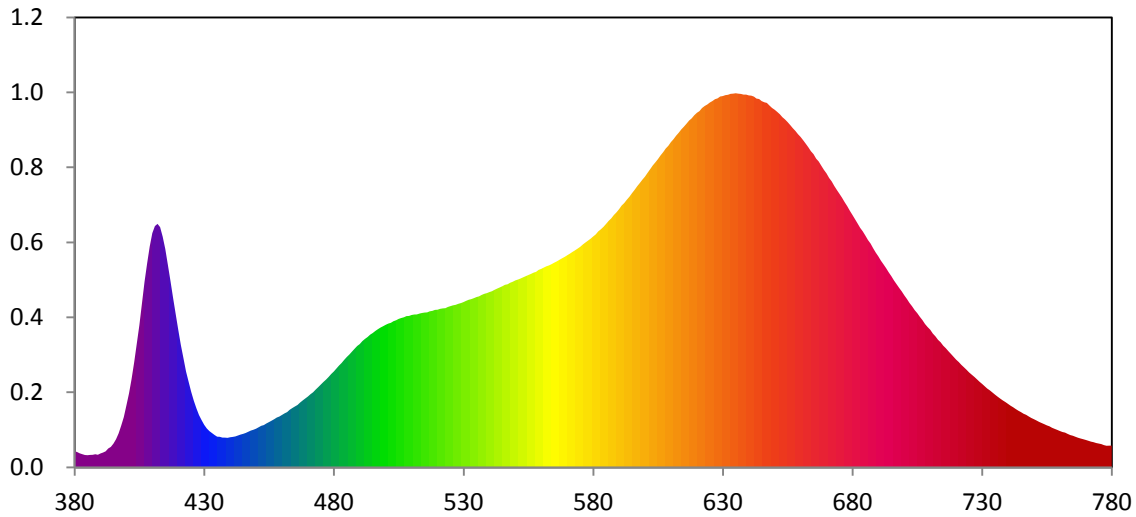
#### Chromaticity Coordinate

x	y	u	v	u'	v'
0.4599	0.4098	0.2629	0.3514	0.2629	0.5271

#### Color Rendering Index

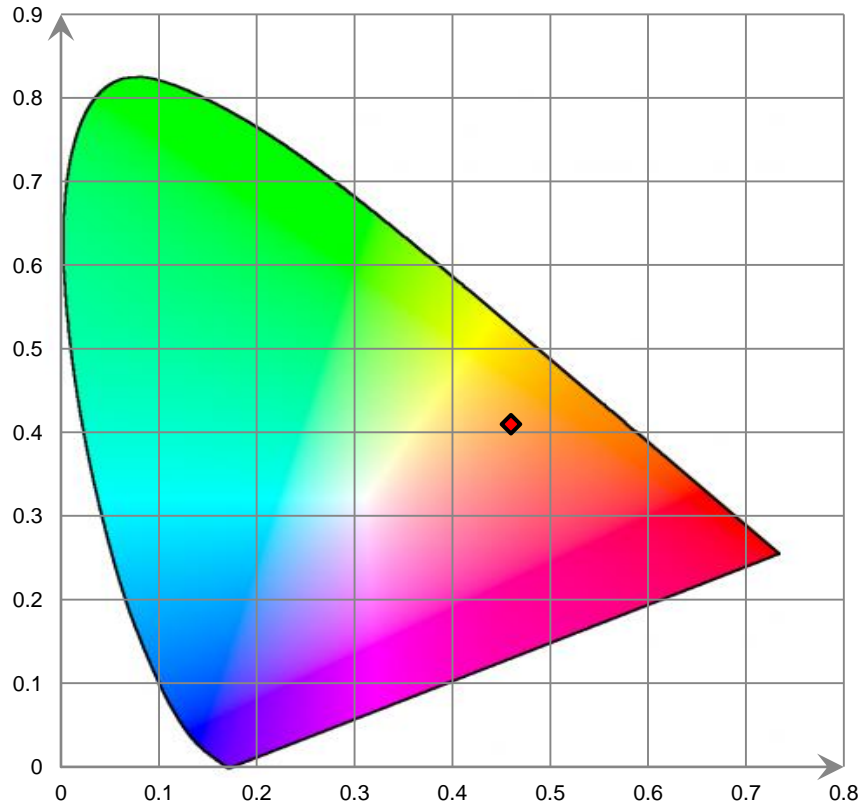
<b>Ra</b>			
95.7			
R1 96	R2 97	R3 98	R4 93
R5 94	R6 92	R7 98	R8 98
R9 96	R10 93	R11 89	R12 75
R13 96	R14 99	R15 98	

Relative Spectral Power Distribution

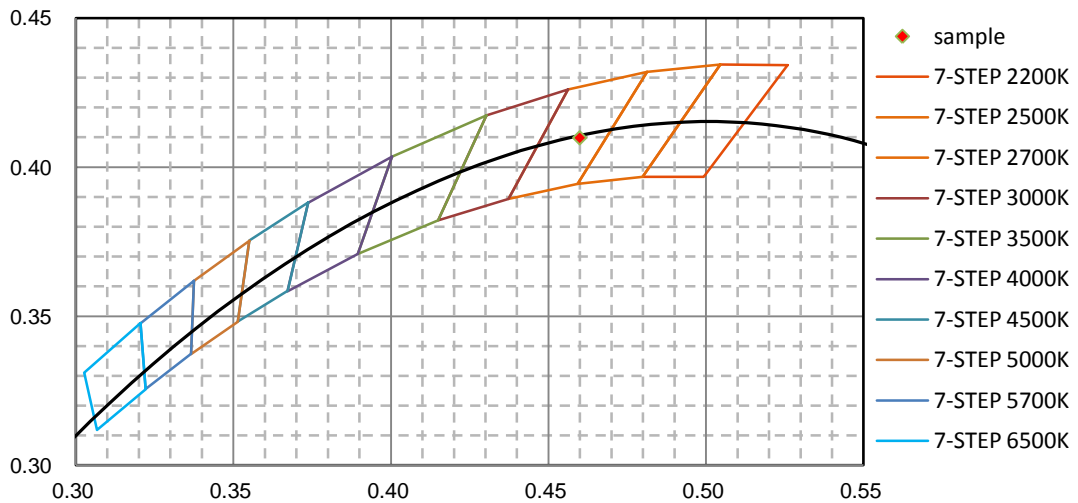


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.248E-01	465	1.962E+00	550	6.013E+00	635	1.203E+01	720	3.467E+00
385	3.942E-01	470	2.281E+00	555	6.186E+00	640	1.196E+01	725	3.055E+00
390	4.494E-01	475	2.668E+00	560	6.385E+00	645	1.178E+01	730	2.687E+00
395	7.673E-01	480	3.086E+00	565	6.584E+00	650	1.150E+01	735	2.341E+00
400	1.995E+00	485	3.551E+00	570	6.821E+00	655	1.110E+01	740	2.044E+00
405	4.572E+00	490	3.968E+00	575	7.093E+00	660	1.063E+01	745	1.779E+00
410	7.535E+00	495	4.322E+00	580	7.424E+00	665	1.007E+01	750	1.552E+00
415	7.025E+00	500	4.586E+00	585	7.831E+00	670	9.454E+00	755	1.353E+00
420	4.425E+00	505	4.777E+00	590	8.303E+00	675	8.797E+00	760	1.172E+00
425	2.428E+00	510	4.902E+00	595	8.818E+00	680	8.120E+00	765	1.020E+00
430	1.372E+00	515	4.980E+00	600	9.351E+00	685	7.454E+00	770	8.855E-01
435	9.903E-01	520	5.072E+00	605	9.912E+00	690	6.786E+00	775	7.687E-01
440	9.714E-01	525	5.188E+00	610	1.046E+01	695	6.152E+00	780	7.024E-01
445	1.081E+00	530	5.317E+00	615	1.095E+01	700	5.535E+00		
450	1.247E+00	535	5.478E+00	620	1.140E+01	705	4.961E+00		
455	1.458E+00	540	5.639E+00	625	1.173E+01	710	4.430E+00		
460	1.689E+00	545	5.827E+00	630	1.194E+01	715	3.917E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



**[Goniophotometer System]**

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

Test orientation: **Base up**

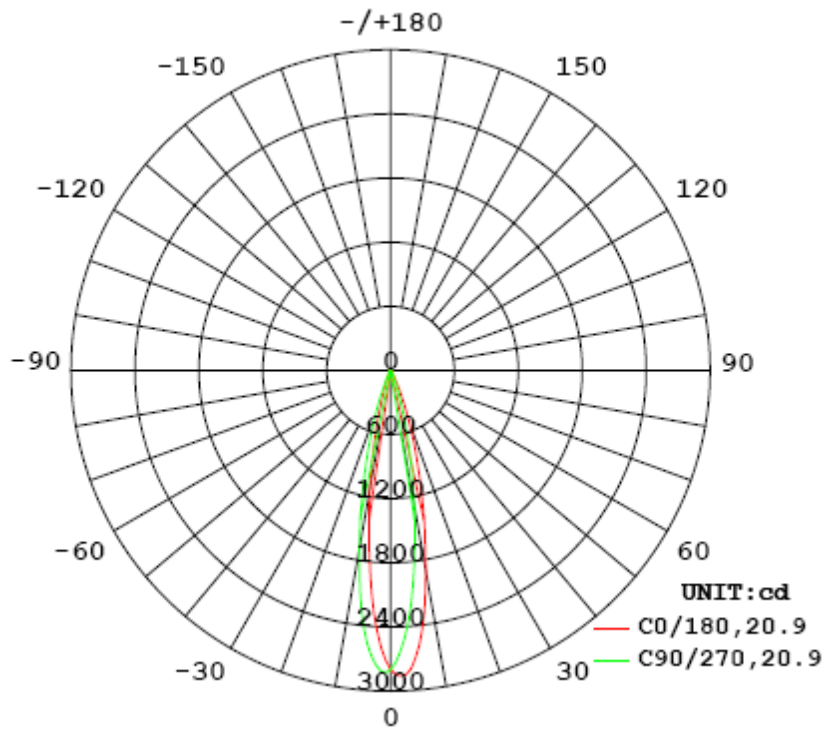
**Electrical Measurement**

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.01	60	0.0921	10.54	0.9536

**Photometric Measurement**

Luminous Flux (lm)	Efficacy (lm/W)	I <sub>max</sub> (cd)	S/MH (C0/180)	S/MH (C90/270)
526.415	49.94	2914	0.44	0.32

**Luminous Intensity Distribution**



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I <sub>max</sub> ):	20.9	20.8	20.9	21.0	20.9
Field Angle (10% I <sub>max</sub> ):	39.8	39.7	39.5	39.6	39.7

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	2797	2797	2797	2797	2797	2797	2797	2797
5.0°	2077	2160	2266	2408	2558	2686	2770	2817
10.0°	1129	1202	1338	1502	1698	1875	2001	2048
15.0°	458	512	604	732	890	1015	1125	1168
20.0°	153	174	212	269	357	460	532	562
25.0°	61	68	80	100	126	157	187	197
30.0°	35	35	35	42	52	61	70	74
35.0°	27	26	28	30	31	30	34	37
40.0°	20	20	23	22	24	23	24	25
45.0°	16	16	19	17	19	21	22	21
50.0°	14	14	15	14	15	17	18	17
55.0°	12	12	12	13	12	14	14	14
60.0°	10	10	9	11	10	11	11	12
65.0°	8	8	8	9	8	9	9	9
70.0°	6	6	6	6	7	7	7	7
75.0°	4	4	4	4	5	5	5	5
80.0°	2	2	2	3	3	3	3	3
85.0°	1	1	1	1	1	1	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

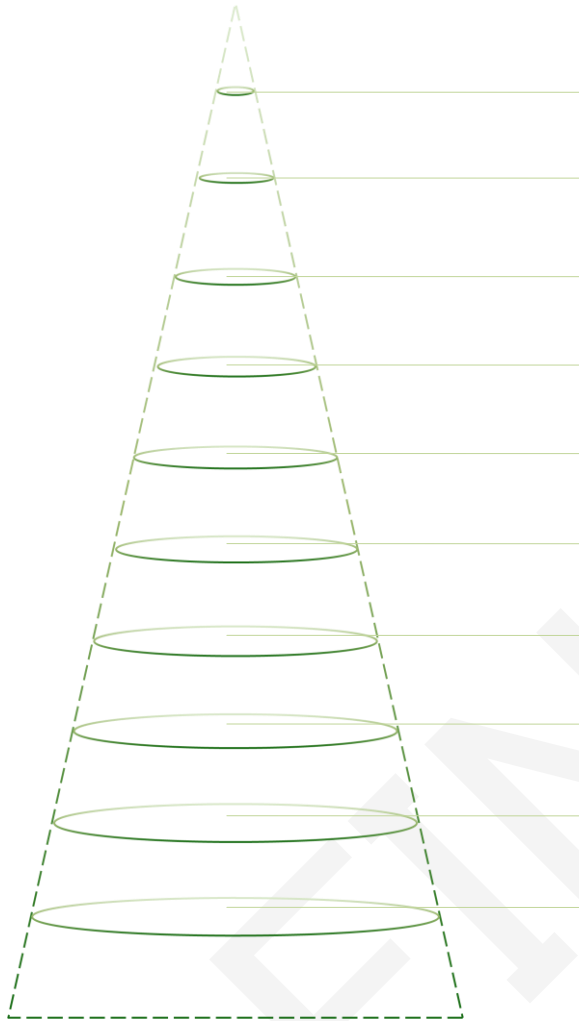


Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	2797	2797	2797	2797	2797	2797	2797	2797
5.0°	2697	2609	2490	2352	2205	2087	2027	2007
10.0°	1904	1782	1611	1437	1292	1171	1078	1052
15.0°	1085	980	849	709	573	478	417	399
20.0°	507	446	349	262	198	168	146	141
25.0°	178	161	126	92	74	63	57	57
30.0°	68	62	52	45	39	33	32	33
35.0°	37	34	33	32	29	27	27	26
40.0°	26	26	26	23	23	24	24	22
45.0°	19	20	20	17	18	20	19	18
50.0°	15	16	16	15	15	16	15	15
55.0°	13	13	13	13	12	12	11	12
60.0°	11	11	10	11	10	9	9	9
65.0°	9	9	8	8	8	7	7	7
70.0°	7	7	6	6	6	5	5	5
75.0°	5	5	5	4	4	4	3	3
80.0°	3	3	3	2	2	2	2	2
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

Average Area Illumination Figure

**Angle:20.9°. Flux out:226.9lm**



Height (m)	Diameter (cm)	E <sub>avg</sub> (lx)	E <sub>max</sub> (lx)
0.5	18.44	7647.0	11555.0
1.0	36.89	1912.0	2889.0
1.5	55.33	849.7	1284.0
2.0	73.77	477.9	722.2
2.5	92.22	305.9	462.2
3.0	110.66	212.4	321.0
3.5	129.11	156.1	235.8
4.0	147.55	119.5	180.5
4.5	165.99	94.4	142.7
5.0	184.44	76.5	115.5

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	61.8	11.75
5-10	136.7	25.96
10-15	128.3	24.38
15-20	81.5	15.48
20-25	40.0	7.59
25-30	18.4	3.50
30-35	11.1	2.10
35-40	8.8	1.68
40-45	7.7	1.47
45-50	6.8	1.30
50-55	6.1	1.15
55-60	5.3	1.02
60-65	4.5	0.85
65-70	3.6	0.69
70-75	2.7	0.51
75-80	1.8	0.34
80-85	0.9	0.18
85-90	0.3	0.05
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	61.8	11.75
0-10	198.5	37.71
0-15	326.8	62.09
0-20	408.3	77.57
0-25	448.3	85.16
0-30	466.7	88.66
0-35	477.8	90.76
0-40	486.6	92.44
0-45	494.4	93.91
0-50	501.2	95.21
0-55	507.3	96.36
0-60	512.6	97.38
0-65	517.1	98.23
0-70	520.7	98.92
0-75	523.4	99.43
0-80	525.2	99.77
0-85	526.1	99.95
0-90	526.4	100.00
0-95	526.4	100.00
0-100	526.4	100.00
0-105	526.4	100.00
0-110	526.4	100.00
0-115	526.4	100.00
0-120	526.4	100.00
0-125	526.4	100.00
0-130	526.4	100.00
0-135	526.4	100.00
0-140	526.4	100.00
0-145	526.4	100.00
0-150	526.4	100.00
0-155	526.4	100.00
0-160	526.4	100.00
0-165	526.4	100.00
0-170	526.4	100.00
0-175	526.4	100.00
0-180	526.4	100.00

Color Spatial Uniformity

**Average Weighted**  
**u': 0.2624 v': 0.5292**

$\gamma \setminus C0-180$	$u'$	$v'$	$Du'v'$	$\gamma \setminus C90-270$	$u'$	$v'$	$Du'v'$
-15	0.2616	0.5301	0.0012	-15	0.2613	0.5292	0.0011
-10	0.2615	0.5298	0.0011	-10	0.2620	0.5292	0.0004
-5	0.2623	0.5294	0.0002	-5	0.2625	0.5291	0.0001
0	0.2635	0.5287	0.0012	0	0.2635	0.5287	0.0012
5	0.2630	0.5285	0.0009	5	0.2632	0.5290	0.0008
10	0.2619	0.5287	0.0007	10	0.2634	0.5297	0.0011
15	0.2611	0.5286	0.0014	15	0.2632	0.5301	0.0012

FINAL

6. Product Photo



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