

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

Soraa, Inc

6500 Kaiser Dr. Fremont, California 94555, USA

Test Model: SM16GA-07-25D-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:	R2DG150507052-10
Test Date:	2015-05-19
Report Date:	2015-06-08
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.
Accreditation:	The NVLAP Lab Code is 200707-0.

STATEMENT: This test may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Shenzhen). The test data was only valid for the test sample(s). This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Federal Government. 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.

1. Product Description

General Information:

One sample was received on 2015-05-07 and used for testing. Sample No.: R2DG150507052-S01 Model: SM16GA-07-25D-927-03

Model Tested: SM16GA-07-25D-927-03
 Manufacturer: Soraa, Inc
 Brand Name: Soraa Vivid
 Product Designation: LED MR16
 Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 100-120 V AC 50/60Hz
 Rated Power: 7.5 W
 Nominal CCT: 2700K
 Nominal Lumen Output: 410 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	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integrating Sphere	SENSING	SPR-600	S09008	1.5 meter	2015-03-16	2016-03-16
Spectral photometer	SENSING	SPR3000	90902027	380nm~800nm	2015-03-16	2016-03-16
Power Meter	YOKOGAWA	WT-210	91j926132	15/30/60/150/300/600 V	2015-03-05	2016-03-05
AC Power Supply	ALL Power	APW-105N	970613	0V-300V 50-400Hz	2015-03-05	2016-03-05
Standard Light Source	EVERFINE	D204	LSD090808	N/A	2014-08-05	2015-08-05
Thermal Meter	SENSING	N/A	N/A	25°C,45°C,55°C	2015-03-05	2016-03-05
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~60V	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 $U=2.1$ ($K=2$), 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
120.01	60.0	0.0648	7.5	0.964

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
442.089	1.944	58.945	2718	-8.00E-04

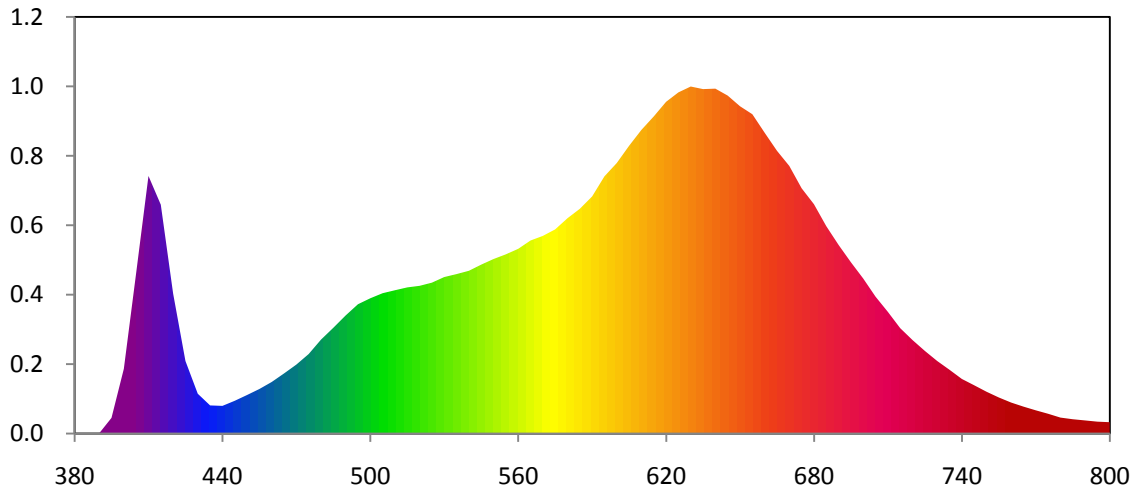
Chromaticity Coordinate

x	y	u	v	u'	v'
0.4571	0.4078	0.2619	0.3506	0.2619	0.5259

Color Rendering Index

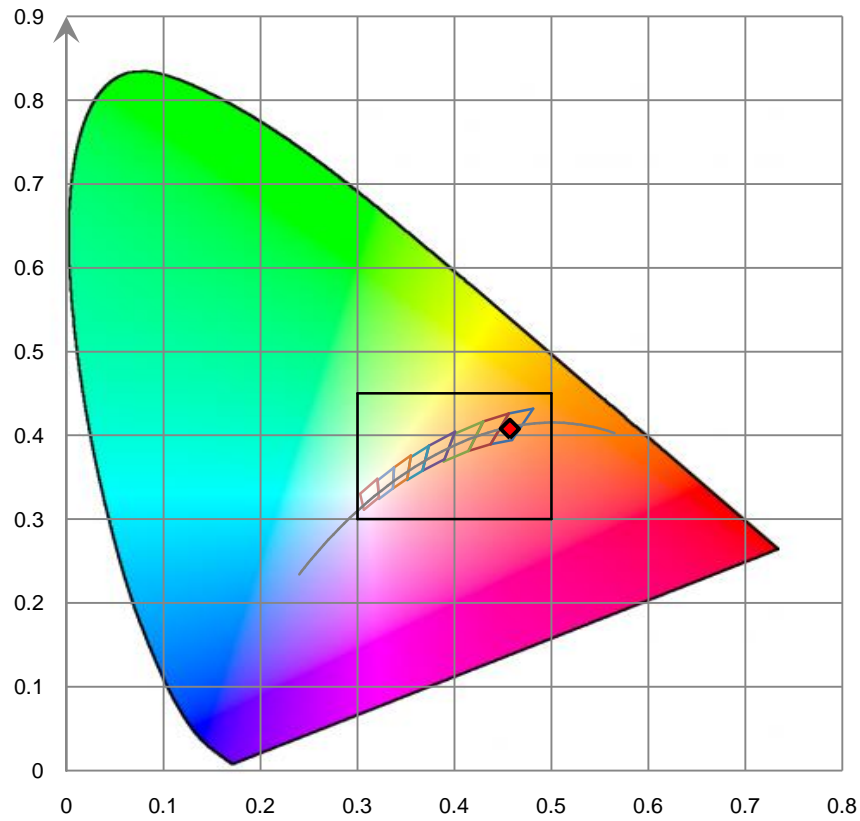
Ra			
95.4			
R1 95	R2 96	R3 98	R4 93
R5 93	R6 91	R7 98	R8 98
R9 97	R10 92	R11 88	R12 74
R13 95	R14 99	R15 98	

Relative Spectral Power Distribution

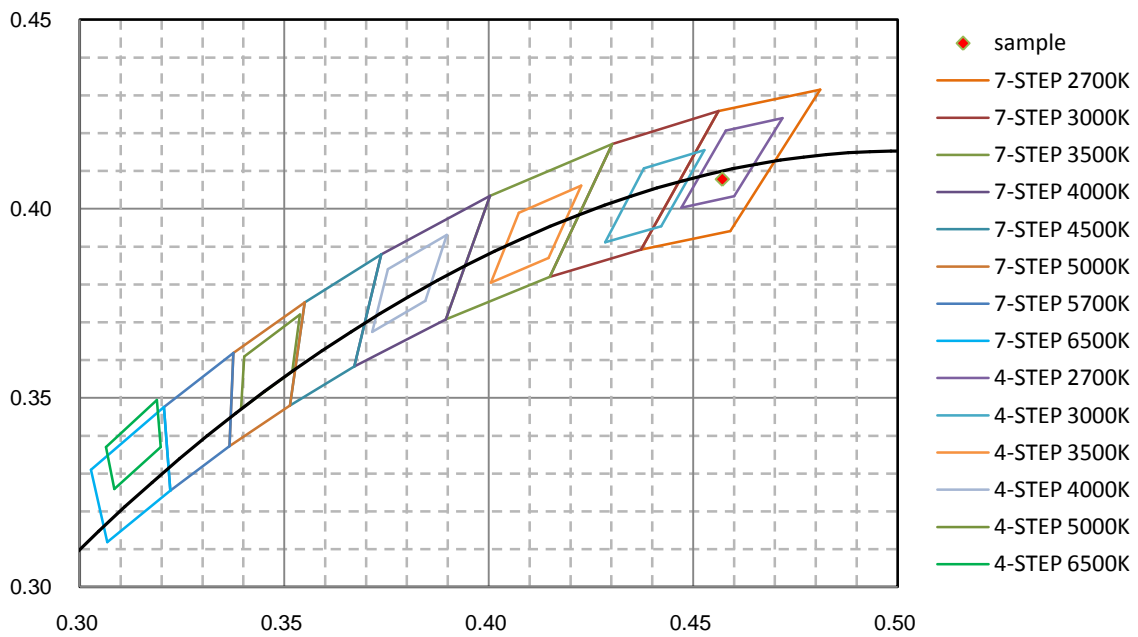


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	0.000E+00	465	8.205E-03	550	2.383E-02	635	4.702E-02	720	1.277E-02
385	0.000E+00	470	9.421E-03	555	2.447E-02	640	4.708E-02	725	1.128E-02
390	3.517E-05	475	1.086E-02	560	2.522E-02	645	4.614E-02	730	9.907E-03
395	2.141E-03	480	1.283E-02	565	2.635E-02	650	4.468E-02	735	8.707E-03
400	8.842E-03	485	1.444E-02	570	2.698E-02	655	4.359E-02	740	7.455E-03
405	2.192E-02	490	1.612E-02	575	2.787E-02	660	4.106E-02	745	6.594E-03
410	3.517E-02	495	1.766E-02	580	2.939E-02	665	3.860E-02	750	5.714E-03
415	3.124E-02	500	1.847E-02	585	3.068E-02	670	3.653E-02	755	4.926E-03
420	1.912E-02	505	1.916E-02	590	3.237E-02	675	3.348E-02	760	4.234E-03
425	9.907E-03	510	1.956E-02	595	3.512E-02	680	3.131E-02	765	3.678E-03
430	5.440E-03	515	1.995E-02	600	3.693E-02	685	2.831E-02	770	3.171E-03
435	3.841E-03	520	2.017E-02	605	3.928E-02	690	2.575E-02	775	2.703E-03
440	3.779E-03	525	2.060E-02	610	4.145E-02	695	2.338E-02	780	2.183E-03
445	4.477E-03	530	2.137E-02	615	4.329E-02	700	2.116E-02	785	1.958E-03
450	5.267E-03	535	2.177E-02	620	4.529E-02	705	1.868E-02	790	1.791E-03
455	6.085E-03	540	2.222E-02	625	4.658E-02	710	1.661E-02	795	1.626E-03
460	7.043E-03	545	2.306E-02	630	4.737E-02	715	1.439E-02	800	1.553E-03

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**

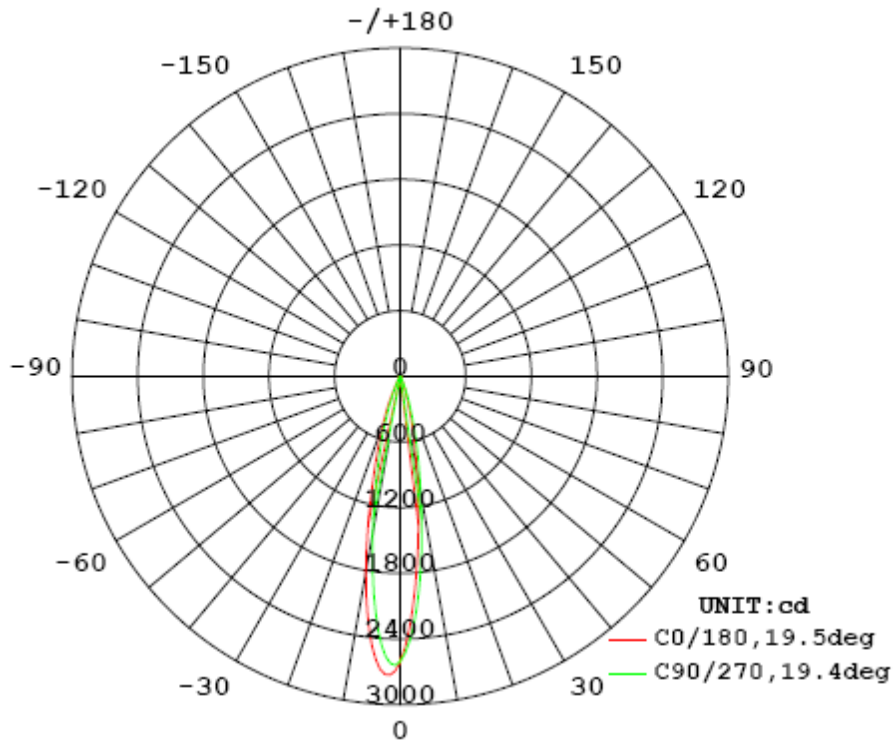
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60.0	0.0654	7.49	0.9536

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	CBCP (cd)	S/MH (C0/180)	S/MH (C90/270)
445.188	59.44	2602	0.43	0.37

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	19.5	19.4	19.4	19.4	19.4
Field Angle (10% I _{max}):	39.3	39.7	39.5	39.2	39.4

Luminous Intensity (cd) Distribution Data

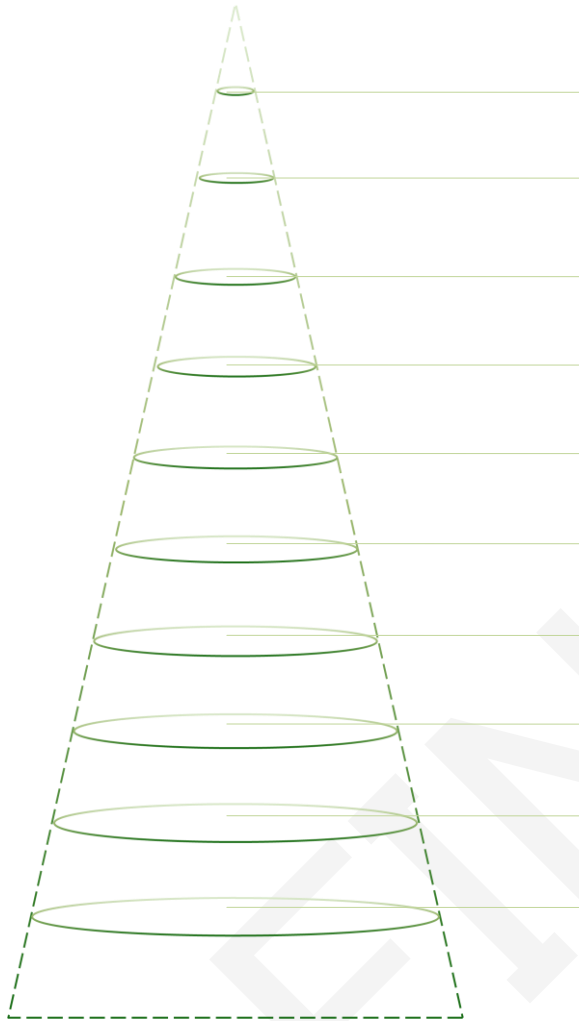
C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	2602	2602	2602	2602	2602	2602	2602	2602
5.0°	2593	2650	2605	2502	2326	2156	1995	1876
10.0°	1816	1868	1786	1641	1455	1290	1102	993
15.0°	952	1003	942	863	733	615	504	426
20.0°	467	497	478	419	324	241	175	151
25.0°	173	195	179	154	107	77	56	47
30.0°	59	65	60	49	38	32	27	25
35.0°	26	27	26	25	21	19	17	16
40.0°	17	17	17	16	15	15	13	13
45.0°	13	13	13	13	12	12	12	11
50.0°	12	12	11	11	10	10	9	8
55.0°	9	9	9	8	8	8	7	6
60.0°	7	8	7	7	6	6	5	5
65.0°	6	6	5	5	5	4	4	4
70.0°	4	4	4	4	4	3	3	3
75.0°	3	3	3	3	2	2	2	2
80.0°	2	2	2	2	1	1	1	1
85.0°	1	1	1	1	1	0	0	0
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°	2602	2602	2602	2602	2602	2602	2602	2602
5.0°	1747	1717	1764	1831	1962	2101	2264	2406
10.0°	875	848	892	961	1084	1221	1406	1577
15.0°	361	348	380	431	502	586	694	800
20.0°	123	109	130	143	189	242	320	375
25.0°	41	40	43	50	59	76	102	126
30.0°	23	23	24	25	28	32	39	47
35.0°	15	15	16	16	18	19	21	22
40.0°	12	13	13	13	14	15	15	16
45.0°	10	11	11	11	12	13	14	14
50.0°	8	8	8	9	9	10	11	11
55.0°	6	7	7	7	7	8	8	9
60.0°	5	5	5	6	6	6	6	7
65.0°	4	4	4	4	4	5	5	5
70.0°	3	3	3	3	3	3	4	4
75.0°	2	2	2	2	2	2	2	3
80.0°	1	1	1	1	1	1	1	1
85.0°	0	0	0	0	0	0	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: 19.40°. Flux out: 177.4 lm.



Height (m)	Diameter (cm)	E _{avg} (lx)	E _{max} (lx)
0.5	17.1	7265.0	10931.0
1.0	34.2	1816.0	2733.0
1.5	51.3	807.2	1215.0
2.0	68.4	454.1	683.2
2.5	85.5	290.6	437.2
3.0	102.6	201.8	303.6
3.5	119.7	148.3	223.1
4.0	136.7	113.5	170.8
4.5	153.8	89.7	134.9
5.0	170.9	72.7	109.3

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	56.7	12.74
5-10	120.7	27.11
10-15	109.2	24.52
15-20	70.3	15.78
20-25	35.5	7.97
25-30	15.1	3.39
30-35	7.9	1.78
35-40	5.6	1.25
40-45	4.9	1.10
45-50	4.5	1.00
50-55	3.9	0.87
55-60	3.2	0.71
60-65	2.6	0.58
65-70	2.0	0.45
70-75	1.5	0.33
75-80	0.9	0.20
80-85	0.4	0.10
85-90	0.1	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	0.01
115-120	0.0	0.00
120-125	0.0	0.00
125-130	0.0	0.01
130-135	0.0	0.01
135-140	0.0	0.00
140-145	0.0	0.01
145-150	0.0	0.01
150-155	0.1	0.01
155-160	0.1	0.02
160-165	0.0	0.01
165-170	0.0	0.00
170-175	0.0	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	56.7	12.74
0-10	177.4	39.85
0-15	286.6	64.37
0-20	356.8	80.15
0-25	392.3	88.12
0-30	407.4	91.51
0-35	415.3	93.29
0-40	420.9	94.54
0-45	425.8	95.64
0-50	430.3	96.64
0-55	434.1	97.51
0-60	437.3	98.22
0-65	439.8	98.80
0-70	441.9	99.25
0-75	443.3	99.58
0-80	444.2	99.78
0-85	444.7	99.88
0-90	444.8	99.91
0-95	444.8	99.91
0-100	444.8	99.91
0-105	444.8	99.91
0-110	444.8	99.91
0-115	444.8	99.92
0-120	444.8	99.92
0-125	444.8	99.92
0-130	444.9	99.93
0-135	444.9	99.94
0-140	444.9	99.94
0-145	445.0	99.95
0-150	445.0	99.96
0-155	445.1	99.97
0-160	445.1	99.99
0-165	445.2	100.00
0-170	445.2	100.00
0-175	445.2	100.00
0-180	445.2	100.00

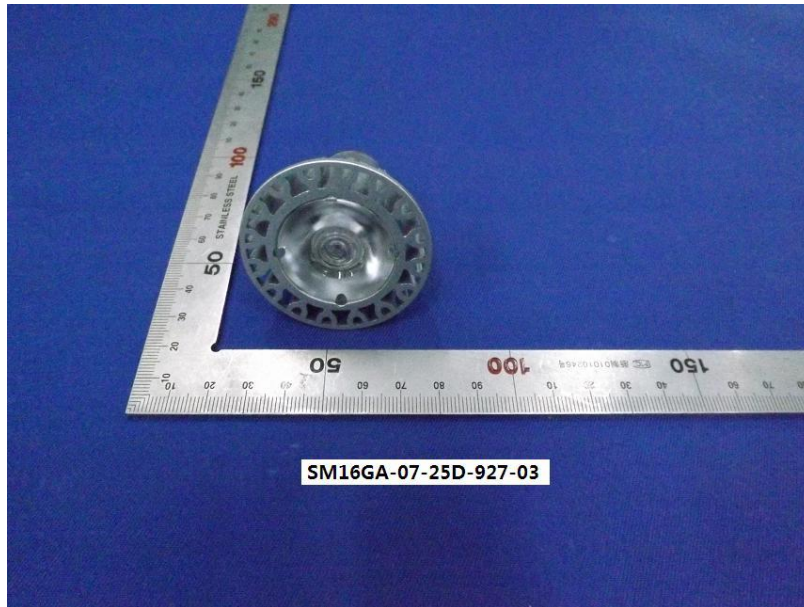
Color Spatial Uniformity

Average Weighted
u': 0.2612, v': 0.5258

$\gamma \setminus C0-180$	u'	v'	$Du'v'$	$\gamma \setminus C90-270$	u'	v'	$Du'v'$
-10	0.2605	0.5252	0.0009	-10	0.2608	0.5261	0.0005
-8	0.2604	0.5251	0.0011	-5	0.2604	0.5256	0.0009
-6	0.2605	0.5252	0.0009	0	0.2605	0.5258	0.0007
-4	0.2608	0.5254	0.0006	5	0.2607	0.5258	0.0005
-2	0.2609	0.5255	0.0005	10	0.2608	0.5257	0.0004
0	0.2611	0.5255	0.0003	0	0.2611	0.5257	0.0002
2	0.2613	0.5256	0.0002	2	0.2612	0.5257	0.0000
4	0.2617	0.5261	0.0005	4	0.2615	0.5259	0.0003
6	0.2620	0.5263	0.0010	6	0.2618	0.5261	0.0007
8	0.2624	0.5263	0.0013	8	0.2622	0.5263	0.0012
10	0.2629	0.5268	0.0020	10	0.2627	0.5265	0.0016

FINAL

6. Product Photo



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