

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

Soraa, Inc

6500 Kaiser Dr. Fremont, California 94555, USA

Test Model: SM16GA-07-10D-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:	R2DG150507051-10
Test Date:	2015-05-18 to 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.: R2DG150507051-S01 Model: SM16GA-07-10D-927-03

Model Tested: SM16GA-07-10D-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: 390 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
120.02	60.0	0.0645	7.5	0.969

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
420.869	1.838	56.116	2670	-2.40E-04

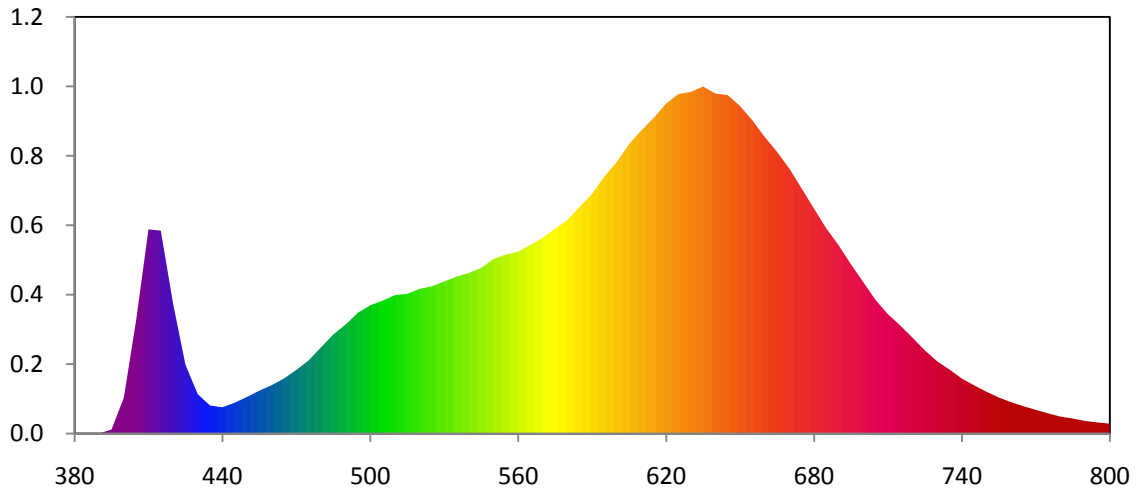
Chromaticity Coordinate

x	y	u	v	u'	v'
0.4620	0.4104	0.2639	0.3517	0.2639	0.5276

Color Rendering Index

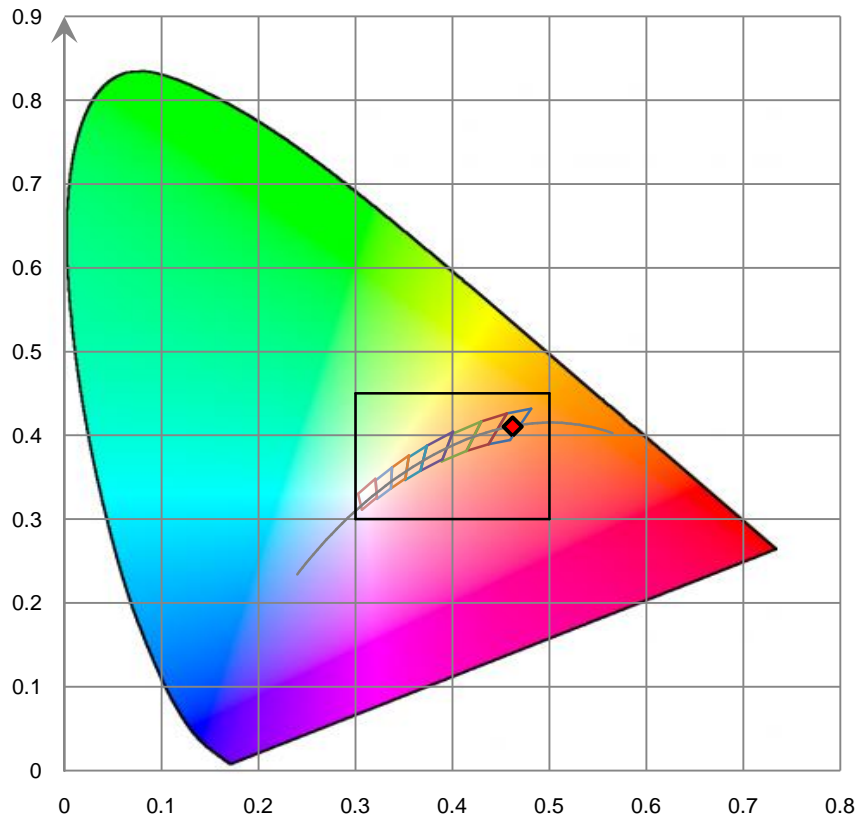
Ra			
95.9			
R1 97	R2 97	R3 98	R4 94
R5 94	R6 92	R7 98	R8 97
R9 93	R10 94	R11 90	R12 77
R13 96	R14 99	R15 98	

Relative Spectral Power Distribution

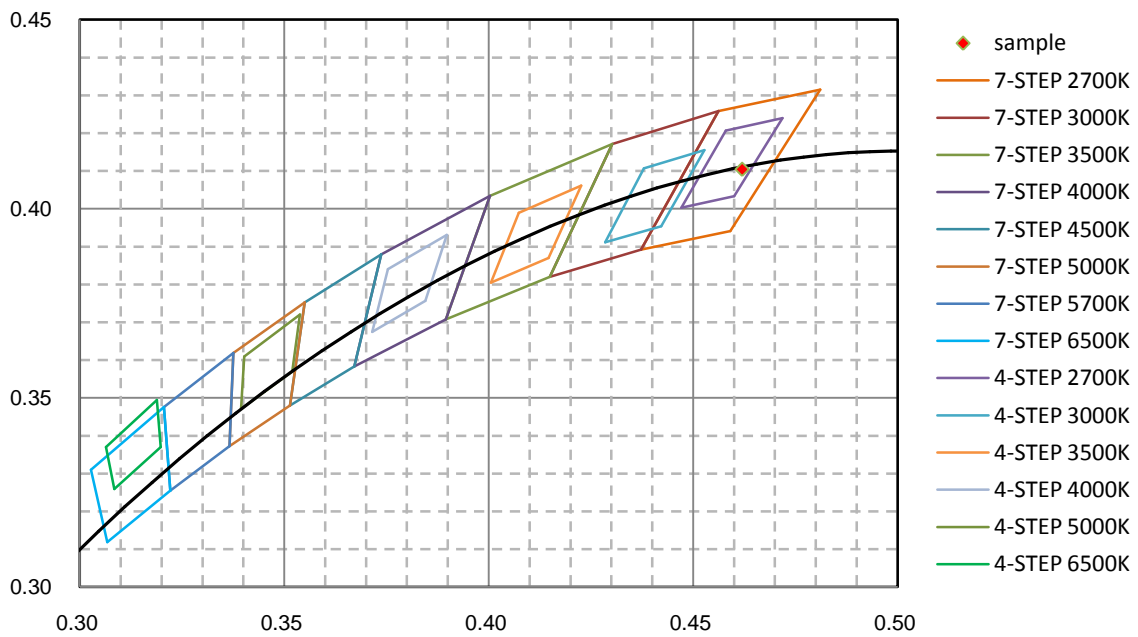


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	0.000E+00	465	7.309E-03	550	2.313E-02	635	4.599E-02	720	1.270E-02
385	0.000E+00	470	8.437E-03	555	2.372E-02	640	4.506E-02	725	1.103E-02
390	0.000E+00	475	9.700E-03	560	2.410E-02	645	4.485E-02	730	9.572E-03
395	5.403E-04	480	1.142E-02	565	2.502E-02	650	4.341E-02	735	8.484E-03
400	4.753E-03	485	1.314E-02	570	2.595E-02	655	4.151E-02	740	7.288E-03
405	1.502E-02	490	1.445E-02	575	2.715E-02	660	3.930E-02	745	6.392E-03
410	2.706E-02	495	1.602E-02	580	2.832E-02	665	3.734E-02	750	5.544E-03
415	2.688E-02	500	1.700E-02	585	3.008E-02	670	3.512E-02	755	4.772E-03
420	1.719E-02	505	1.761E-02	590	3.177E-02	675	3.249E-02	760	4.158E-03
425	9.136E-03	510	1.834E-02	595	3.406E-02	680	2.982E-02	765	3.622E-03
430	5.213E-03	515	1.852E-02	600	3.600E-02	685	2.719E-02	770	3.148E-03
435	3.713E-03	520	1.917E-02	605	3.836E-02	690	2.496E-02	775	2.679E-03
440	3.486E-03	525	1.953E-02	610	4.019E-02	695	2.244E-02	780	2.245E-03
445	4.090E-03	530	2.015E-02	615	4.184E-02	700	2.008E-02	785	1.996E-03
450	4.860E-03	535	2.080E-02	620	4.373E-02	705	1.770E-02	790	1.672E-03
455	5.685E-03	540	2.128E-02	625	4.499E-02	710	1.582E-02	795	1.475E-03
460	6.411E-03	545	2.196E-02	630	4.527E-02	715	1.433E-02	800	1.313E-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**

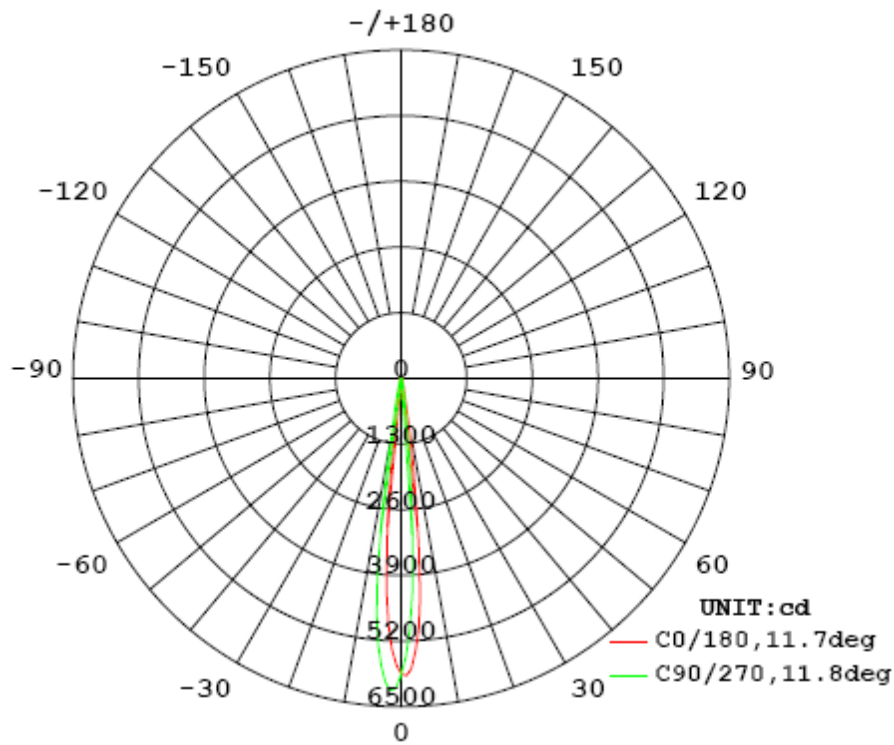
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60.0	0.0648	7.447	0.9569

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	CBCP (cd)	S/MH (C0/180)	S/MH (C90/270)
418.767	56.23	5850	0.17	0.23

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	11.7	11.6	11.8	11.9	11.8
Field Angle (10% I _{max}):	19.4	19.1	19.3	19.4	19.3

Luminous Intensity (cd) Distribution Data

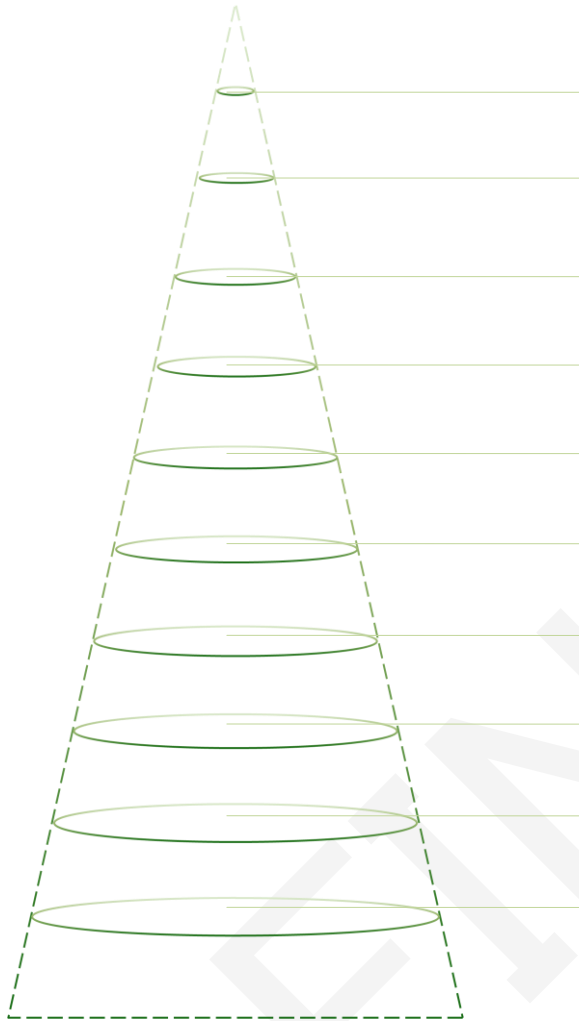
C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	5850	5850	5850	5850	5850	5850	5850	5850
5.0°	3278	3900	4498	4982	5279	5459	5346	5104
10.0°	517	559	665	1161	1092	1517	1124	1241
15.0°	165	188	208	247	268	286	277	264
20.0°	81	87	95	104	111	118	117	111
25.0°	57	58	62	64	66	69	70	69
30.0°	46	47	49	52	50	53	54	52
35.0°	38	40	40	43	42	44	45	44
40.0°	27	30	31	34	32	36	36	37
45.0°	18	20	21	23	21	24	25	26
50.0°	16	16	16	16	15	15	15	15
55.0°	16	16	15	15	14	14	14	14
60.0°	16	15	15	15	14	13	14	14
65.0°	15	15	14	14	13	13	13	13
70.0°	13	13	13	13	13	12	12	12
75.0°	10	11	11	11	11	11	10	10
80.0°	6	7	7	8	8	8	7	7
85.0°	2	3	3	4	4	4	4	4
90.0°	0	0	0	1	1	1	1	1
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°	5850	5850	5850	5850	5850	5850	5850	5850
5.0°	4308	3557	2953	2457	2201	2069	2163	2413
10.0°	623	541	421	419	369	360	375	429
15.0°	212	181	169	142	144	136	146	144
20.0°	94	82	76	73	75	75	75	75
25.0°	58	52	50	51	54	55	54	56
30.0°	49	43	39	47	45	45	43	44
35.0°	46	39	34	43	39	37	36	36
40.0°	37	29	26	29	29	27	26	26
45.0°	22	20	18	17	17	17	18	18
50.0°	15	15	14	14	14	14	15	16
55.0°	14	15	15	15	15	15	15	16
60.0°	14	14	14	14	13	14	14	15
65.0°	13	13	13	13	13	13	14	14
70.0°	12	12	12	12	11	11	12	12
75.0°	9	9	9	9	8	8	9	9
80.0°	6	6	6	5	5	5	5	5
85.0°	3	3	2	2	2	1	1	2
90.0°	1	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: 11.80°. Flux out: 150.7 lm.



Height (m)	Diameter (cm)	E _{avg} (lx)	E _{max} (lx)
0.5	10.3	17368.0	24742.0
1.0	20.7	4342.0	6185.0
1.5	31.0	1930.0	2749.0
2.0	41.3	1086.0	1546.0
2.5	51.7	694.7	989.7
3.0	62.0	482.4	687.3
3.5	72.3	354.5	504.9
4.0	82.7	271.4	386.6
4.5	93.0	214.4	305.5
5.0	103.3	173.7	247.4

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	115.4	27.57
5-10	129.8	31.00
10-15	42.0	10.02
15-20	21.8	5.19
20-25	15.0	3.58
25-30	13.2	3.16
30-35	12.9	3.09
35-40	12.0	2.86
40-45	9.4	2.25
45-50	6.9	1.65
50-55	6.5	1.54
55-60	6.8	1.63
60-65	6.7	1.60
65-70	6.6	1.57
70-75	5.8	1.38
75-80	4.3	1.02
80-85	2.4	0.57
85-90	0.8	0.19
90-95	0.1	0.02
95-100	0.0	0.01
100-105	0.0	0.01
105-110	0.0	0.00
110-115	0.0	0.01
115-120	0.0	0.00
120-125	0.0	0.01
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	0.0	0.01
155-160	0.0	0.01
160-165	0.0	0.00
165-170	0.0	0.01
170-175	0.0	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	115.4	27.57
0-10	245.3	58.57
0-15	287.2	68.59
0-20	309.0	73.78
0-25	324.0	77.36
0-30	337.2	80.52
0-35	350.1	83.61
0-40	362.1	86.47
0-45	371.5	88.72
0-50	378.4	90.37
0-55	384.9	91.91
0-60	391.7	93.54
0-65	398.4	95.14
0-70	405.0	96.71
0-75	410.8	98.09
0-80	415.1	99.11
0-85	417.4	99.68
0-90	418.2	99.87
0-95	418.3	99.89
0-100	418.4	99.90
0-105	418.4	99.91
0-110	418.4	99.91
0-115	418.4	99.92
0-120	418.4	99.92
0-125	418.5	99.93
0-130	418.5	99.94
0-135	418.5	99.95
0-140	418.6	99.95
0-145	418.6	99.96
0-150	418.6	99.97
0-155	418.7	99.98
0-160	418.7	99.99
0-165	418.7	99.99
0-170	418.8	100.00
0-175	418.8	100.00
0-180	418.8	100.00

Color Spatial Uniformity

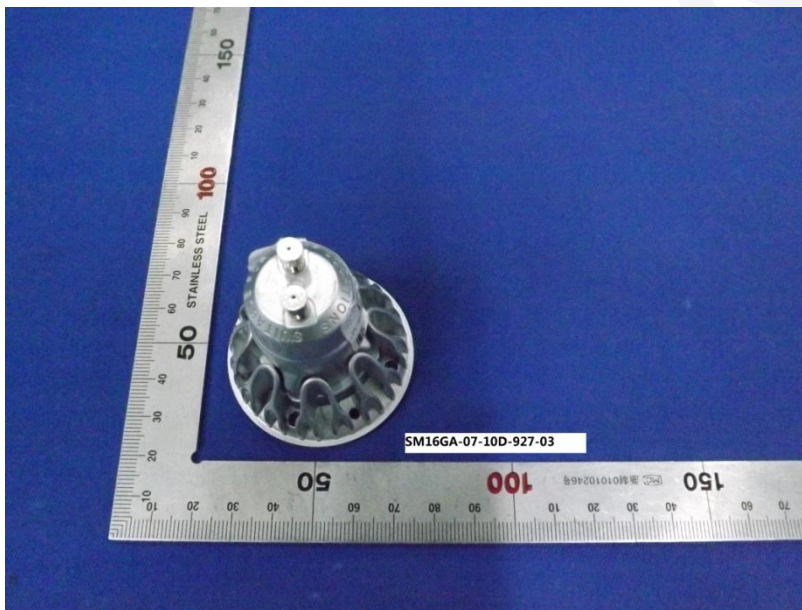
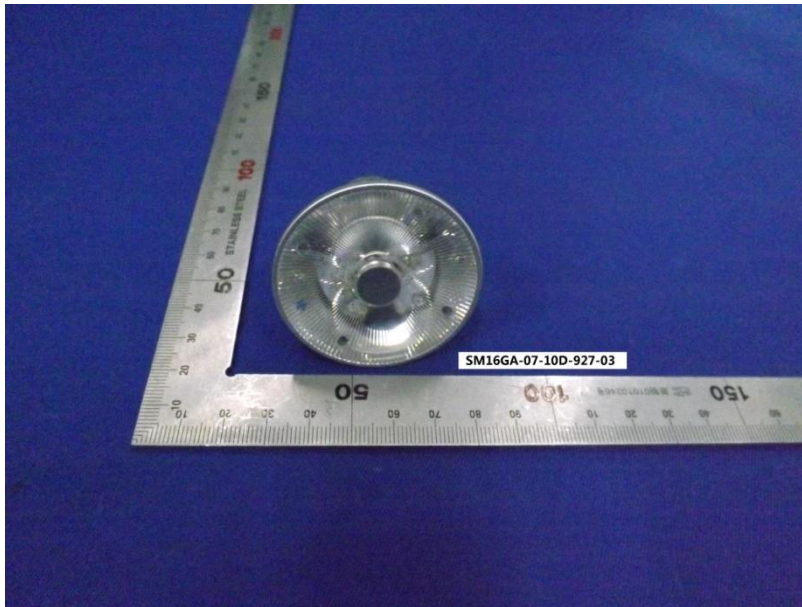
Average Weighted
u': 0.2640, v': 0.5279

$\gamma \setminus C0-180$	u'	v'	$Du'v'$
-10	0.2623	0.5276	0.0017
-8	0.2622	0.5276	0.0018
-6	0.2642	0.5285	0.0006
-4	0.2645	0.5285	0.0008
-2	0.2639	0.5280	0.0002
0	0.2640	0.5274	0.0004
2	0.2644	0.5275	0.0005
4	0.2641	0.5277	0.0002
6	0.2636	0.5279	0.0004
8	0.2641	0.5282	0.0004
10	0.2643	0.5283	0.0006

$\gamma \setminus C90-270$	u'	v'	$Du'v'$
-10	0.2624	0.5275	0.0017
-5	0.2629	0.5278	0.0011
0	0.2640	0.5284	0.0005
5	0.2645	0.5285	0.0008
10	0.2641	0.5283	0.0004
0	0.2640	0.5277	0.0002
2	0.2641	0.5273	0.0006
4	0.2638	0.5274	0.0005
6	0.2639	0.5276	0.0003
8	0.2639	0.5280	0.0002
10	0.2647	0.5288	0.0012

FINAL

6. Product Photo



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