

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

Soraa, Inc

6500 Kaiser Dr. Fremont, California 94555, USA

Test Model: SM16GA-09-36D-827-03

Report Type:	Electrical and Photometric tests including: Luminous Flux, Color, Luminous Intensity Distribution, THD
Test Engineer:	Daniel Duan <i>Daniel Duan</i>
Report Number:	R2DG160519051-10A1
Test Date:	2016-05-20 to 2016-05-21
Report Date:	2016-05-24
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 2016-05-19 and used for testing.

Model Tested: SM16GA-09-36D-827-03
 Manufacturer: Soraa, Inc
 Brand Name: SORAA BRILLIANT
 Product Designation: LED MR16-GU10
 Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120 V AC 50/60Hz
 Rated Power: 9 W
 Nominal CCT: 2700K
 Nominal Lumen Output: 560 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
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
DC Power Supply	EVERFINE	WY305-V1	1101047	30V/5A	2015-07-27	2016-07-26
Thermal Meter	Anymetre	JR900A	N/A	25°C	2016-01-12	2017-01-11
Standard Light Source	SENSING	N/A	LSD090808	N/A	2015-09-25	2016-09-24
AC Power Supply	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,3000 W/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.

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.

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 $U=1.6\%$ ($K=2$), at the 95% confidence level.

Additional Test

The Additional Test item may not be covered by IESNA LM-79-2008. Additional test including power factor, off-state power and THD, was measured by Digital Power Meter after stabilized at $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$. Test voltage for THD and power factor test would be equal to rated voltage or, in case of a voltage range, maximum value of that range.

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.

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	59.98	0.07853	8.992	0.954

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
608.76	2.032	67.7	2755	8.98E-04

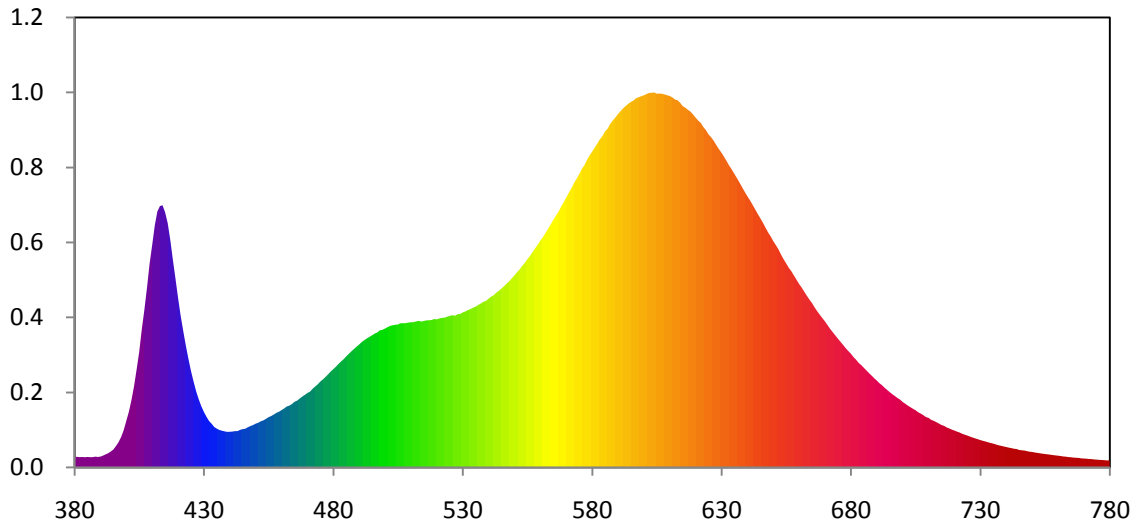
Chromaticity Coordinate

x	y	u	v	u'	v'
0.4569	0.4123	0.2598	0.3517	0.2598	0.5276

Color Rendering Index

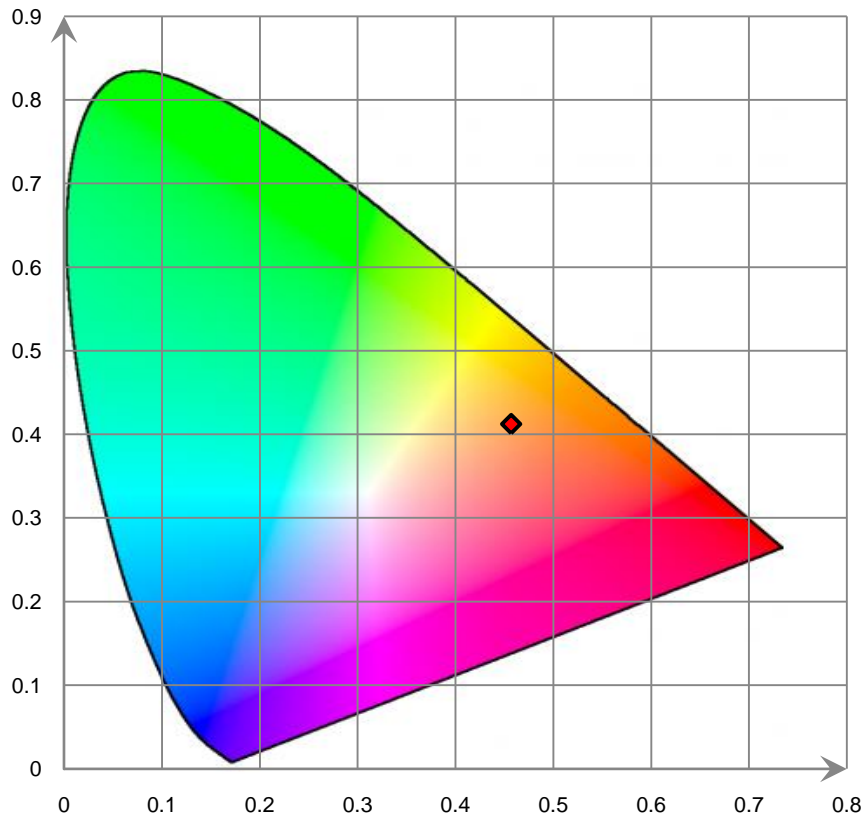
Ra			
83.2			
R1 82	R2 94	R3 91	R4 82
R5 84	R6 96	R7 81	R8 56
R9 6	R10 89	R11 83	R12 86
R13 84	R14 95	R15 72	

Relative Spectral Power Distribution

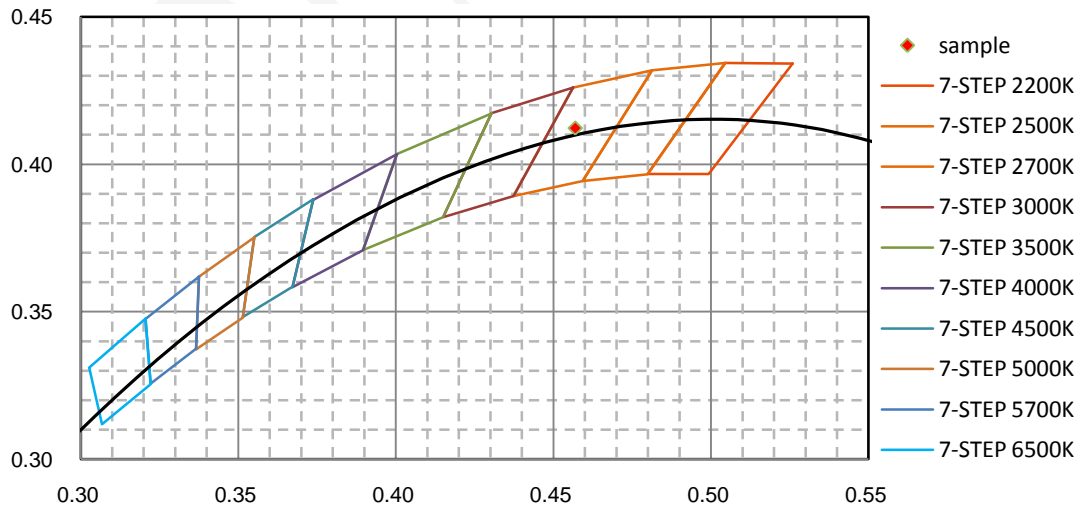


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.494E-01	465	2.155E+00	550	6.298E+00	635	9.621E+00	720	1.212E+00
385	3.456E-01	470	2.444E+00	555	6.833E+00	640	8.890E+00	725	1.046E+00
390	3.568E-01	475	2.820E+00	560	7.441E+00	645	8.171E+00	730	8.985E-01
395	5.881E-01	480	3.226E+00	565	8.121E+00	650	7.422E+00	735	7.825E-01
400	1.527E+00	485	3.645E+00	570	8.850E+00	655	6.690E+00	740	6.718E-01
405	3.796E+00	490	4.035E+00	575	9.622E+00	660	6.013E+00	745	5.743E-01
410	7.296E+00	495	4.337E+00	580	1.036E+01	665	5.386E+00	750	5.074E-01
415	8.364E+00	500	4.556E+00	585	1.102E+01	670	4.787E+00	755	4.411E-01
420	5.562E+00	505	4.693E+00	590	1.159E+01	675	4.221E+00	760	3.859E-01
425	3.165E+00	510	4.762E+00	595	1.199E+01	680	3.729E+00	765	3.362E-01
430	1.815E+00	515	4.805E+00	600	1.221E+01	685	3.267E+00	770	2.924E-01
435	1.273E+00	520	4.859E+00	605	1.226E+01	690	2.851E+00	775	2.588E-01
440	1.171E+00	525	4.971E+00	610	1.218E+01	695	2.470E+00	780	2.320E-01
445	1.258E+00	530	5.084E+00	615	1.185E+01	700	2.146E+00		
450	1.436E+00	535	5.275E+00	620	1.147E+01	705	1.875E+00		
455	1.652E+00	540	5.535E+00	625	1.092E+01	710	1.627E+00		
460	1.882E+00	545	5.870E+00	630	1.032E+01	715	1.392E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

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

Test orientation: **Base up**

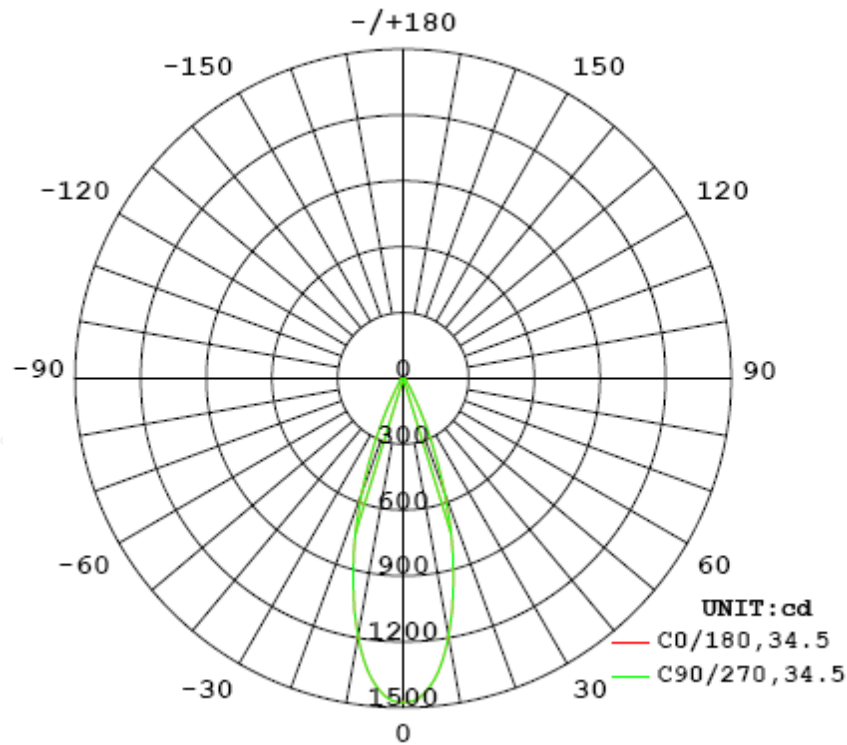
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60	0.0775	8.99	0.9659

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
599.289	66.66	1475	0.56	0.56

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	34.5	34.5	34.5	34.5	34.5
Field Angle (10% I _{max}):	57.2	57.2	57.2	57.2	57.2

Luminous Intensity (cd) Distribution Data

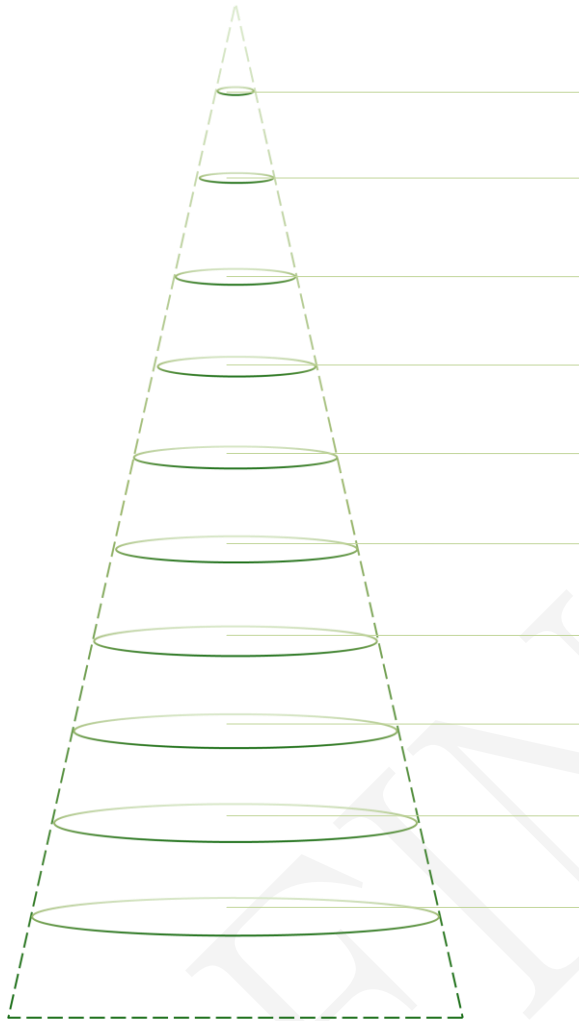
C \ y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1475	1475	1475	1475	1475	1475	1475	1475
5.0°	1408	1408	1408	1408	1408	1408	1408	1408
10.0°	1194	1194	1194	1194	1194	1194	1194	1194
15.0°	885	885	885	885	885	885	885	885
20.0°	553	553	553	553	553	553	553	553
25.0°	274	274	274	274	274	274	274	274
30.0°	116	116	116	116	116	116	116	116
35.0°	57	57	57	57	57	57	57	57
40.0°	36	36	36	36	36	36	36	36
45.0°	27	27	27	27	27	27	27	27
50.0°	22	22	22	22	22	22	22	22
55.0°	20	20	20	20	20	20	20	20
60.0°	16	16	16	16	16	16	16	16
65.0°	13	13	13	13	13	13	13	13
70.0°	10	10	10	10	10	10	10	10
75.0°	7	7	7	7	7	7	7	7
80.0°	4	4	4	4	4	4	4	4
85.0°	2	2	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°	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 γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1475	1475	1475	1475	1475	1475	1475	1475
5.0°	1408	1408	1408	1408	1408	1408	1408	1408
10.0°	1194	1194	1194	1194	1194	1194	1194	1194
15.0°	885	885	885	885	885	885	885	885
20.0°	553	553	553	553	553	553	553	553
25.0°	274	274	274	274	274	274	274	274
30.0°	116	116	116	116	116	116	116	116
35.0°	57	57	57	57	57	57	57	57
40.0°	36	36	36	36	36	36	36	36
45.0°	27	27	27	27	27	27	27	27
50.0°	22	22	22	22	22	22	22	22
55.0°	20	20	20	20	20	20	20	20
60.0°	16	16	16	16	16	16	16	16
65.0°	13	13	13	13	13	13	13	13
70.0°	10	10	10	10	10	10	10	10
75.0°	7	7	7	7	7	7	7	7
80.0°	4	4	4	4	4	4	4	4
85.0°	2	2	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°	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:34.5°. Flux out:323.5lm



Height (m)	Diameter (cm)	E _{avg} (lx)	E _{max} (lx)
0.5	31.05	3901.0	5898.0
1.0	62.10	975.4	1475.0
1.5	93.15	433.5	655.4
2.0	124.20	243.8	368.6
2.5	155.25	156.1	235.9
3.0	186.30	108.4	163.8
3.5	217.36	79.6	120.4
4.0	248.41	61.0	92.2
4.5	279.46	48.2	72.8
5.0	310.51	39.0	59.0

Zonal Lumen Density Measurement

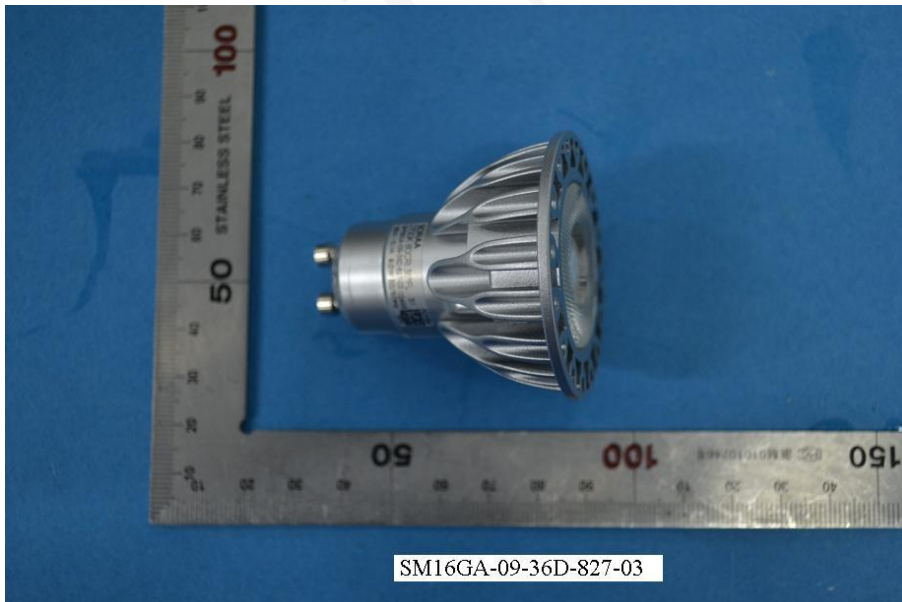
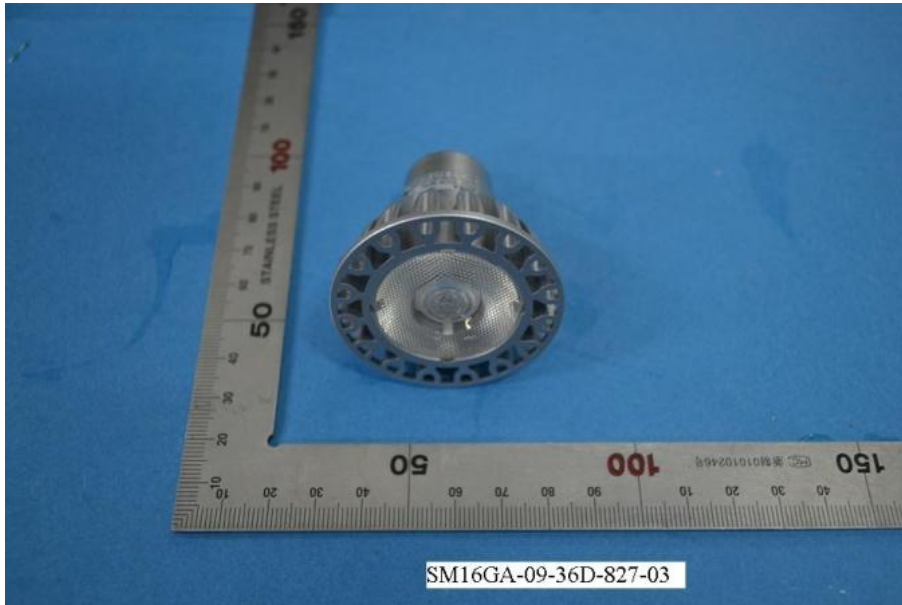
Deg	Flux (lm)	%
0-5	34.5	5.76
5-10	93.1	15.53
10-15	122.6	20.46
15-20	117.5	19.60
20-25	84.1	14.04
25-30	46.2	7.70
30-35	23.7	3.96
35-40	15.1	2.51
40-45	11.4	1.89
45-50	9.8	1.64
50-55	9.1	1.52
55-60	8.3	1.39
60-65	7.2	1.20
65-70	5.9	0.98
70-75	4.3	0.72
75-80	2.9	0.49
80-85	1.6	0.27
85-90	0.4	0.07
90-95	0.0	0.01
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	0.01
125-130	0.1	0.01
130-135	0.1	0.01
135-140	0.1	0.02
140-145	0.2	0.02
145-150	0.2	0.04
150-155	0.2	0.04
155-160	0.2	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	34.5	5.76
0-10	127.6	21.29
0-15	250.2	41.75
0-20	367.7	61.35
0-25	451.8	75.39
0-30	497.9	83.09
0-35	521.7	87.05
0-40	536.7	89.56
0-45	548.1	91.45
0-50	557.9	93.09
0-55	567.0	94.61
0-60	575.3	96.00
0-65	582.5	97.20
0-70	588.4	98.18
0-75	592.7	98.90
0-80	595.6	99.39
0-85	597.3	99.66
0-90	597.7	99.73
0-95	597.7	99.74
0-100	597.7	99.74
0-105	597.7	99.74
0-110	597.7	99.74
0-115	597.8	99.75
0-120	597.8	99.75
0-125	597.8	99.76
0-130	597.9	99.77
0-135	598.0	99.78
0-140	598.1	99.80
0-145	598.2	99.82
0-150	598.4	99.86
0-155	598.7	99.90
0-160	598.9	99.94
0-165	599.1	99.97
0-170	599.2	99.99
0-175	599.3	100.00
0-180	599.3	100.00

[Additional Test]

Test Item	Test Voltage (V)	Frequency (Hz)	Test Result
Total Harmonic Distortion:	120.0	60	16.12%

6. Product Photo



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