



REPORT

545 E. Algonquin Rd., Arlington Heights, IL 60005

Project No. G102406056

Date: March 10, 2016

REPORT NO. 102406056CHI-002

TEST OF ONE AR111 LAMP

MODEL NO. SR111-18-36D-927-03

LED MODEL NO. SORAA

DRIVER MODEL NO. SORAA

RENDERED TO

SORAA

6500 KAISER DR. SUITE 110

FREMONT, CA 94555

TEST: Electrical and Photometric tests as required to the IESNA test standard.

STATEMENT OF LIMITATION: This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

AUTHORIZATION: The testing performed was authorized by signed quote number Qu-00660665.

STANDARDS USED: The following American National Standards or Illuminating Engineering Society of North America Test Guides were used in part or totally to test each specimen:

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting

ANSI NEMA ANSLG C78.377: 2012: Specifications of the Chromaticity of Solid State Lighting Products

DESCRIPTION OF SAMPLE: The client submitted one production sample of model number SR111-18-36D-927-03. The sample was received by Intertek on March 1, 2016, in undamaged condition and one sample was tested as received. The sample designation was AH03012016050546-2.

DATES OF TESTS: March 8, 2016 through March 10, 2016.

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SUMMARY

| | |
|--------------|---------------------|
| Model No.: | SR111-18-36D-927-03 |
| Description: | AR111 Lamp |

| Criteria | Result | |
|-----------------------------|--------|------------|
| | Sphere | Goniometer |
| Total Lumen Output (Lumens) | 1095 | 1130 |
| Total Power (W) | 18.78 | 18.79 |
| Luminaire Efficacy (LPW) | 58.31 | 60.14 |

| Criteria | Result |
|--|--------|
| Power Factor | 0.921 |
| Current ATHD % | 32.82 |
| Correlated Color Temperature (CCT - K) | 2761 |
| Color Rendering Index (CRI - Ra) | 96.1 |
| Color Rendering Index (CRI - R9) | 95.2 |
| DUV | 0.000 |
| Chromaticity Coordinate (x) | 0.454 |
| Chromaticity Coordinate (y) | 0.409 |
| Chromaticity Coordinate (u') | 0.260 |
| Chromaticity Coordinate (v') | 0.526 |

EQUIPMENT LIST

| Equipment Used | Model Number | Control Number | Last Date Calibrated | Calibration Due Date | Date Used |
|------------------------------------|--------------|----------------|----------------------|----------------------|-----------|
| Yokogawa Power Meter | WT210 | 146919 | 07/14/15 | 07/14/16 | 03/10/16 |
| Omega Thermometer | DPI8-C24 | 146920 | 10/09/15 | 10/09/16 | 03/10/16 |
| LSI High Speed Mirror Goniometer | 6440T | 146928 | VBU | VBU | 03/10/16 |
| Newport Hygrometer | iServer | 146956 | 01/04/16 | 01/04/17 | 03/10/16 |
| Elgar, AC Power Supply | CW1251P | 146918 | VBU | VBU | 03/10/16 |
| 2 Meter Sphere & Spectroradiometer | MS760/CDS11C | 146137 | VBU | VBU | 03/08/16 |
| Elgar AC Power Supply | CW1251M | 146113 | VBU | VBU | 03/08/16 |
| Sorenson DC Power Supply | XFR150-8 | 146847 | VBU | VBU | 03/08/16 |
| Newport Humidity Recorder | iTHX-SD | 146382 | 07/09/15 | 07/09/16 | 03/08/16 |
| Yokogawa Power Meter | WT1600 | 146770 | 04/07/15 | 04/07/16 | 03/08/16 |
| Omega Temperature Meter | MDSi8 | 146873 | 07/09/15 | 07/09/16 | 03/08/16 |



TEST METHODS

Seasoning in Sample Orientation – LED Products

No seasoning was performed in accordance with IESNA LM-79.

Photometric and Electrical Measurements – Integrating Sphere Method

A Labsphere Model CDS 1100 CCD Array Spectroradiometer and Two Meter or Ten Foot Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Xitron or Yokogawa Power Analyzer.

The calibration of the sphere photometer-spectroradiometer system is traceable to the National Institute of Standards and Technology.

Photometric and Electrical Measurements – Distribution Method

A LSI Type C High Speed Model 6440 Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for each sample.

Ambient temperature was measured equal to the height of the sample mounted on the Goniometer equipment. Each sample was operated at input rated voltage in its designated orientation. Each sample was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Xitron or Yokogawa Power Analyzer.

Some graphics were created with Photometrics Plus software.

RESULTS OF TEST

Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) - Integrating Sphere Method

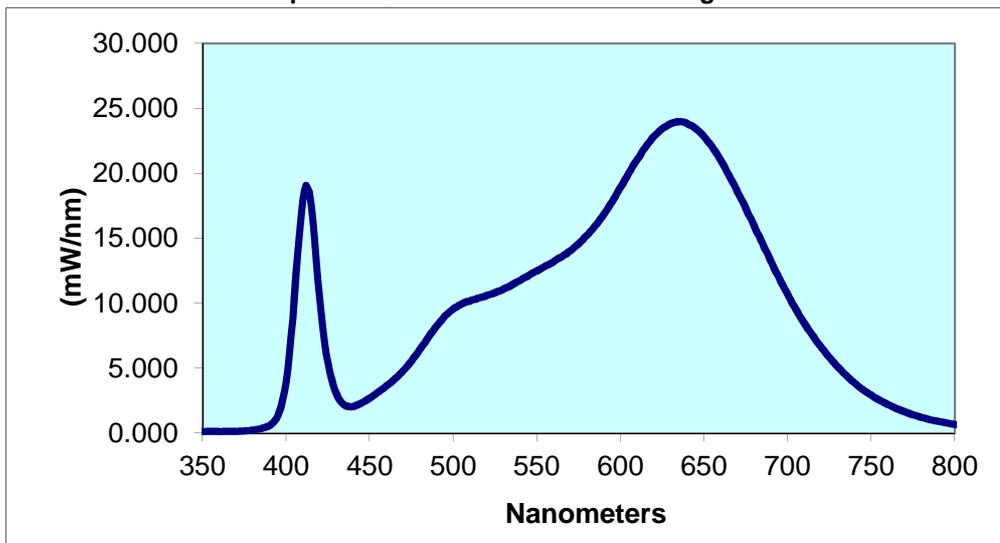
| Intertek Sample No. | Base Orientation | Input Voltage {Vac} | Input Current (mA) | Input Power (Watts) | Input Power Factor | Input Current ATHD (%) | Luminous Flux (Lumens) | Lumen Efficacy (LPW) |
|---------------------|------------------|---------------------|--------------------|---------------------|--------------------|------------------------|------------------------|----------------------|
| AH03012016050546-2 | Up | 12.0 | 1699 | 18.78 | 0.921 | 32.82 | 1095 | 58.31 |

| Correlated Color Temperature (K) | CRI -Ra | CRI -R9 | DUV | CIE 31' Chromaticity Coordinate (x) | CIE 31' Chromaticity Coordinate (y) | CIE 76' Chromaticity Coordinate (u') | CIE 76' Chromaticity Coordinate (v') |
|----------------------------------|---------|---------|-------|-------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|
| 2761 | 96.1 | 95.2 | 0.000 | 0.454 | 0.409 | 0.260 | 0.526 |

Spectral Distribution over Visible Wavelengths

| nm | mW/nm |
|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|
| 350 | 0.124 | 440 | 2.055 | 530 | 11.09 | 620 | 22.82 | 710 | 8.453 |
| 355 | 0.116 | 445 | 2.307 | 535 | 11.41 | 625 | 23.43 | 715 | 7.508 |
| 360 | 0.125 | 450 | 2.694 | 540 | 11.76 | 630 | 23.80 | 720 | 6.610 |
| 365 | 0.128 | 455 | 3.149 | 545 | 12.13 | 635 | 23.95 | 725 | 5.825 |
| 370 | 0.129 | 460 | 3.639 | 550 | 12.50 | 640 | 23.83 | 730 | 5.095 |
| 375 | 0.168 | 465 | 4.175 | 555 | 12.84 | 645 | 23.45 | 735 | 4.444 |
| 380 | 0.228 | 470 | 4.795 | 560 | 13.21 | 650 | 22.83 | 740 | 3.859 |
| 385 | 0.345 | 475 | 5.541 | 565 | 13.60 | 655 | 22.02 | 745 | 3.351 |
| 390 | 0.572 | 480 | 6.447 | 570 | 14.04 | 660 | 21.02 | 750 | 2.925 |
| 395 | 1.333 | 485 | 7.352 | 575 | 14.58 | 665 | 19.84 | 755 | 2.537 |
| 400 | 3.933 | 490 | 8.235 | 580 | 15.24 | 670 | 18.59 | 760 | 2.208 |
| 405 | 10.51 | 495 | 9.016 | 585 | 16.00 | 675 | 17.30 | 765 | 1.908 |
| 410 | 17.98 | 500 | 9.553 | 590 | 16.86 | 680 | 15.95 | 770 | 1.640 |
| 415 | 17.56 | 505 | 9.956 | 595 | 17.81 | 685 | 14.61 | 775 | 1.410 |
| 420 | 10.43 | 510 | 10.16 | 600 | 18.89 | 690 | 13.22 | 780 | 1.215 |
| 425 | 5.440 | 515 | 10.39 | 605 | 20.01 | 695 | 11.92 | | |
| 430 | 3.060 | 520 | 10.59 | 610 | 21.05 | 700 | 10.69 | | |
| 435 | 2.148 | 525 | 10.81 | 615 | 22.00 | 705 | 9.518 | | |

Spectral Data Over Visible Wavelengths



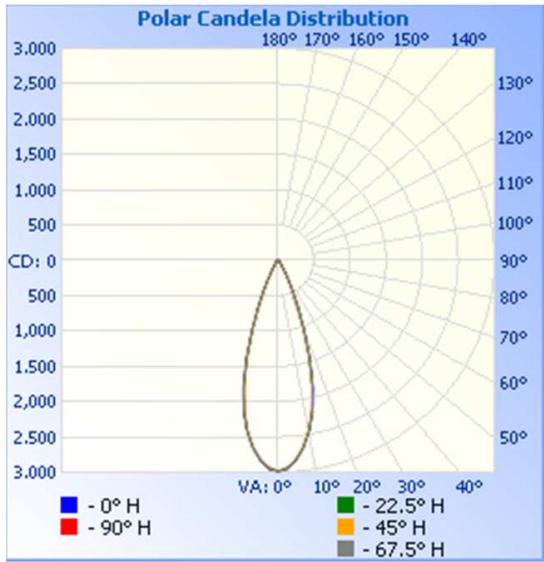
RESULTS OF TEST (cont'd)

Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) – Distribution Method

| Intertek Sample No. | Base Orientation | Input Voltage {Vac} | Input Current (mA) | Input Power (Watts) | Input Power Factor | Absolute Luminous Flux (Lumens) | Lumen Efficacy (LPW) |
|---------------------|------------------|---------------------|--------------------|---------------------|--------------------|---------------------------------|----------------------|
| AH03012016050546-2 | Up | 12.1 | 1690 | 18.79 | 0.920 | 1130 | 60.14 |

Intensity (Candlepower) Summary at 25°C - Candelas

| Angle | 0 | 22.5 | 45 | 67.5 | 90 |
|-------|------|------|------|------|------|
| 0 | 2983 | 2983 | 2983 | 2983 | 2983 |
| 5 | 2843 | 2832 | 2828 | 2826 | 2826 |
| 10 | 2460 | 2454 | 2444 | 2451 | 2448 |
| 15 | 1870 | 1837 | 1819 | 1840 | 1839 |
| 20 | 1067 | 1039 | 1042 | 1051 | 1045 |
| 25 | 496 | 476 | 478 | 486 | 480 |
| 30 | 204 | 189 | 195 | 199 | 190 |
| 35 | 95 | 86 | 91 | 92 | 87 |
| 40 | 56 | 52 | 55 | 55 | 53 |
| 45 | 39 | 38 | 40 | 40 | 39 |
| 50 | 32 | 32 | 32 | 32 | 32 |
| 55 | 28 | 28 | 28 | 28 | 28 |
| 60 | 23 | 23 | 23 | 23 | 23 |
| 65 | 19 | 19 | 19 | 19 | 19 |
| 70 | 14 | 15 | 15 | 15 | 14 |
| 75 | 10 | 10 | 10 | 10 | 10 |
| 80 | 5 | 5 | 6 | 5 | 5 |
| 85 | 2 | 2 | 2 | 2 | 2 |
| 90 | 0 | 0 | 0 | 0 | 0 |

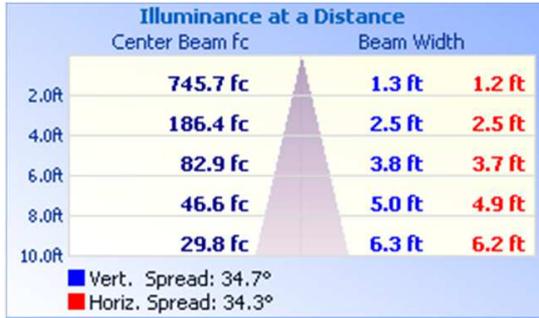


RESULTS OF TEST (cont'd)

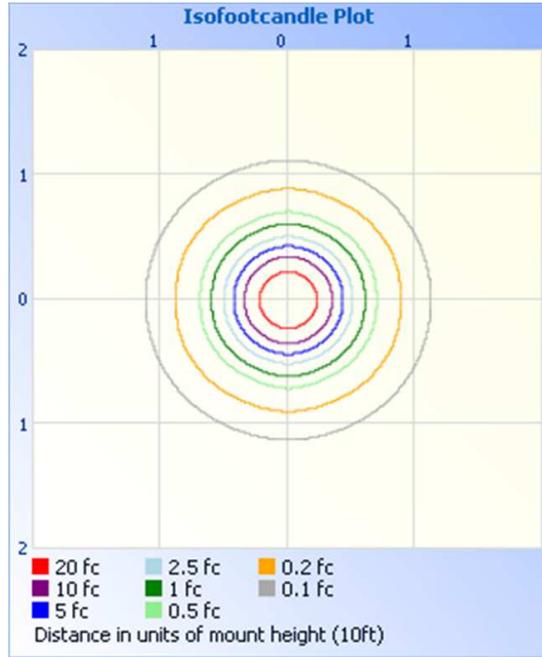
Illumination Plots

Mounting Height: 10 ft.

Illuminance - Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25°C

| Zone | Lumens | % Luminaire |
|--------|--------|-------------|
| 0-30 | 980.1 | 86.8 |
| 0-40 | 1043 | 92.3 |
| 0-60 | 1098 | 97.2 |
| 60-90 | 31.1 | 2.8 |
| 0-90 | 1130 | 100.0 |
| 90-180 | 0.0 | 0.0 |
| 0-180 | 1130 | 100.0 |

Zonal Lumens and Percentages at 25°C

| Zone | Lumens | % Luminaire |
|-------|--------|-------------|
| 0-10 | 257.4 | 22.8 |
| 10-20 | 488.0 | 43.2 |
| 20-30 | 234.6 | 20.8 |
| 30-40 | 62.6 | 5.5 |
| 40-50 | 31.2 | 2.8 |
| 50-60 | 24.6 | 2.2 |
| 60-70 | 18.5 | 1.6 |
| 70-80 | 10.3 | 0.9 |
| 80-90 | 2.3 | 0.2 |

PICTURES (not to scale)



CONCLUSION

The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Tests:



Timothy Quigley
Engineer
Lighting Division

Attachment: None

Report Reviewed By:



Kenda Branch
Team Lead
Lighting Division