

Test Report

Report Number: L18089

Date: Nov 1, 2018

Issued by:

Dialight Optics Laboratory
1501 Route 34 South, Farmingdale, NJ 07727

Test of one High Output High Bay
Unit manufacturer: Dialight Corporation
Unit model number: H6x-7NCB-Kxxx-xxx

Issued to:

Dialight Corporation
1501 Route 34 South, Farmingdale, NJ 07727

Tests performed: Photometric characterization and temperature measurement per the described standards.

Dates of test: October 22, 2018 through November 2, 2018

Standards used: All tests are performed in accordance with procedures and guidelines prescribed by the American National Standards Institute (ANSI) or Illuminating Engineering Society of North America (IES):

- IES LM-79:2008: Electrical and Photometric Measurements of Solid-State Lighting Products
- ANSI/UL 1598:2008: Underwriters Laboratories Inc. Standard for Safety: Luminaires
- ENERGY STAR Manufacturer's Guide for Qualifying Solid State Lighting Luminaires Version 2.1

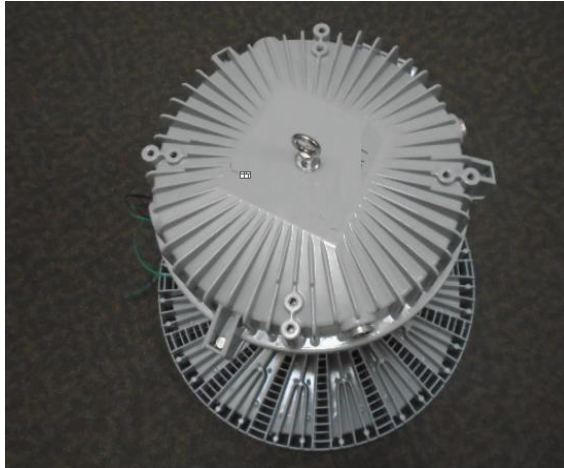
Description of sample:

Sample Number: L18089
Manufacturer: Dialight Corporation
Product Name: H6x-7NCB-Kxxx-xxx
Description: High Output High Bay
Model Number: H6x-7NCB-Kxxx-xxx

Report Summary

Sample number L18089
Dialight unit model number H6x-7NCB-Kxxx-xxx

Photograph(s) of sample:



*Photographs not to scale. For reference only.

Summary of Results:

| | <u>Integrating Sphere</u> | <u>Goniophotometer</u> |
|--------------------|---------------------------|------------------------|
| Luminous Flux: | 43220 (lumens) | 43723 (lumens) |
| Electrical Power: | 315.9 (W) | 314.7 (W) |
| Luminous Efficacy: | 137.3 (lumens/W) | 138.9 (lumens/W) |

Electrical Measurements:

Input Power (347VAC): 315.9 (W)
Power Factor (347VAC): 0.968
Current ATHD % (347VAC): 8.35

Color Measurements:

Correlated Color Temperature (CCT): 5112
Color Rendering Index (CRI): 85.8
Chromaticity Coordinate (x): 0.342
Chromaticity Coordinate (y): 0.353
Chromaticity Coordinate (u'): 0.209
Chromaticity Coordinate (v'): 0.323
DUV: 0.0016

Temperature Measurements:

In Situ LED Source Temperature: 50.7 (°C)

Test Results: Integrating Sphere

Results include unit color, flux, efficacy and electrical power for sample number L18089.

Dialight unit model number H6x-7NCB-Kxxx-xxx

Test Conditions:

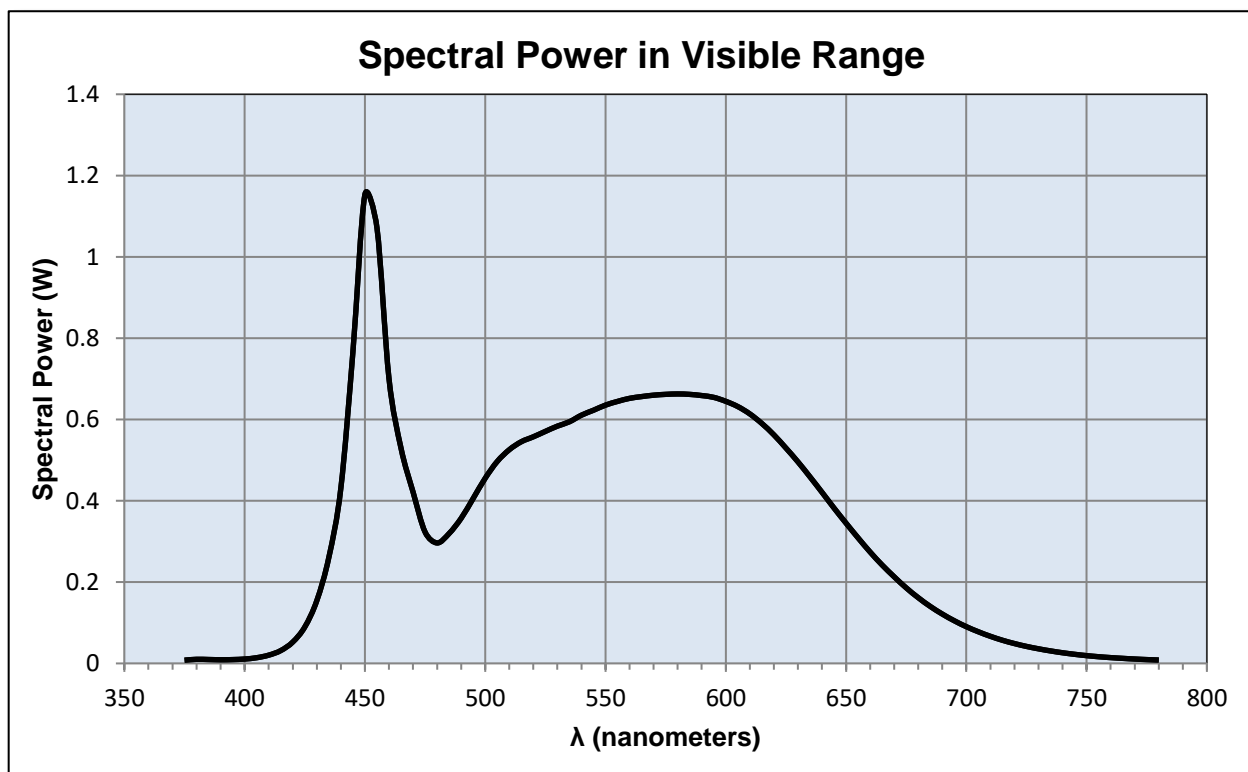
Ambient Temperature: 25 ± 1 (°C)

Electrical Measurements:

Input Voltage: 347 (VAC)
Input Current: 0.947 (A)
Input Power: 315.9 (W)
Input Power Factor: 0.968
Current ATHD: 8.35 (%)

Photometric measurements:

Luminous Flux: 43220 (lumens)
Luminous Efficacy: 137.3 (lumens/W)
Correlated Color Temperature (CCT): 5112 (K)
CRI -Ra: 85.8
CRI -R9: 22.4
DUV: 0.0016
CIE Coordinate (x): 0.342
CIE Coordinate (y): 0.353
CIE Coordinate (u'): 0.209
CIE Coordinate (v'): 0.323



Test Results: Integrating Sphere

Results continued from previous page.

Tabulated Spectral Power in Visible Range:

| $\lambda(\text{nm})$ | (W/nm) | $\lambda(\text{nm})$ | (W/nm) | $\lambda(\text{nm})$ | (W/nm) |
|----------------------|--------|----------------------|--------|----------------------|--------|
| 375 | 0.008 | 515 | 0.545 | 655 | 0.309 |
| 380 | 0.010 | 520 | 0.557 | 660 | 0.274 |
| 385 | 0.010 | 525 | 0.571 | 665 | 0.242 |
| 390 | 0.009 | 530 | 0.584 | 670 | 0.213 |
| 395 | 0.009 | 535 | 0.594 | 675 | 0.186 |
| 400 | 0.011 | 540 | 0.611 | 680 | 0.162 |
| 405 | 0.014 | 545 | 0.623 | 685 | 0.140 |
| 410 | 0.020 | 550 | 0.635 | 690 | 0.121 |
| 415 | 0.032 | 555 | 0.644 | 695 | 0.105 |
| 420 | 0.053 | 560 | 0.652 | 700 | 0.090 |
| 425 | 0.090 | 565 | 0.656 | 705 | 0.078 |
| 430 | 0.154 | 570 | 0.660 | 710 | 0.067 |
| 435 | 0.261 | 575 | 0.662 | 715 | 0.057 |
| 440 | 0.431 | 580 | 0.663 | 720 | 0.049 |
| 445 | 0.766 | 585 | 0.662 | 725 | 0.042 |
| 450 | 1.153 | 590 | 0.659 | 730 | 0.036 |
| 455 | 1.072 | 595 | 0.654 | 735 | 0.031 |
| 460 | 0.701 | 600 | 0.645 | 740 | 0.026 |
| 465 | 0.530 | 605 | 0.632 | 745 | 0.022 |
| 470 | 0.422 | 610 | 0.614 | 750 | 0.019 |
| 475 | 0.323 | 615 | 0.590 | 755 | 0.017 |
| 480 | 0.296 | 620 | 0.562 | 760 | 0.014 |
| 485 | 0.320 | 625 | 0.530 | 765 | 0.012 |
| 490 | 0.357 | 630 | 0.496 | 770 | 0.011 |
| 495 | 0.406 | 635 | 0.459 | 775 | 0.009 |
| 500 | 0.456 | 640 | 0.421 | 780 | 0.008 |
| 505 | 0.497 | 645 | 0.382 | | |
| 510 | 0.526 | 650 | 0.345 | | |

Test Results: Goniometer

Results include unit flux, distribution, efficacy, and electrical power for sample number L18089.
Dialight unit model number H6x-7NCB-Kxxx-xxx

Electrical Measurements:

Input Voltage: 480 (VAC)
Input current: 0.677 (A)
Input Power: 314.7 (W)
Power Factor: 0.968

Photometric measurements:

Absolute Luminous Flux: 43723 (lumens)
Luminous Efficacy: 138.9 (lumens/W)

Intensity Summary:

| <u>INTENSITY (CANDLEPOWER) SUMMARY</u> | | | | | | |
|--|-------|-------|-------|-------|--------|---------------|
| ANGLE | ALONG | 23 | 45 | 67.5 | ACROSS | OUTPUT LUMENS |
| 0 | 62295 | 62295 | 62295 | 62295 | 62295 | |
| 5 | 57264 | 57358 | 57692 | 57848 | 58171 | 2202 |
| 15 | 36325 | 36456 | 36823 | 36946 | 37226 | 9175 |
| 25 | 22715 | 22771 | 22938 | 23086 | 23185 | 10803 |
| 35 | 14958 | 14921 | 15003 | 15085 | 15174 | 9942 |
| 45 | 8126 | 8113 | 8255 | 8414 | 8471 | 7960 |
| 55 | 1216 | 1217 | 1269 | 1289 | 1330 | 2829 |
| 65 | 608 | 606 | 630 | 648 | 656 | 671 |
| 75 | 55 | 53 | 54 | 50 | 52 | 109 |
| 85 | 15 | 15 | 15 | 14 | 14 | 31 |
| 95 | 0 | 0 | 0 | 0 | 0 | 2 |
| 105 | 0 | 0 | 0 | 0 | 0 | 0 |
| 115 | 0 | 0 | 0 | 0 | 0 | 0 |
| 125 | 0 | 0 | 0 | 0 | 0 | 0 |
| 135 | 0 | 0 | 0 | 0 | 0 | 0 |
| 145 | 0 | 0 | 0 | 0 | 0 | 0 |
| 155 | 0 | 0 | 0 | 0 | 0 | 0 |
| 165 | 0 | 0 | 0 | 0 | 0 | 0 |
| 175 | 0 | 0 | 0 | 0 | 0 | 0 |
| 180 | 0 | 0 | 0 | 0 | 0 | 0 |

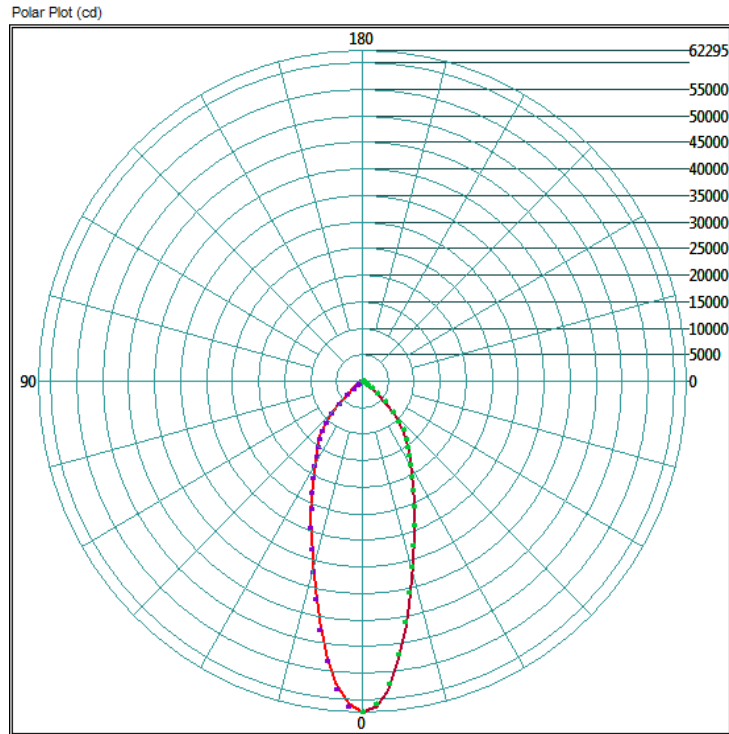
ZONAL LUMEN AND PERCENTAGES

| ZONE | LUMENS | % LUMINAIRE |
|--------|----------|-------------|
| 0-30 | 27301.69 | 62.4% |
| 0-40 | 36545.13 | 83.6% |
| 0-60 | 43258.18 | 98.9% |
| 60-90 | 626.99 | 1.4% |
| 0-90 | 43723.4 | 100.0% |
| 90-180 | 0 | 0.0% |
| 0-180 | 43723.4 | 100.0% |

Test Results: Goniometer

Results continued from previous page.

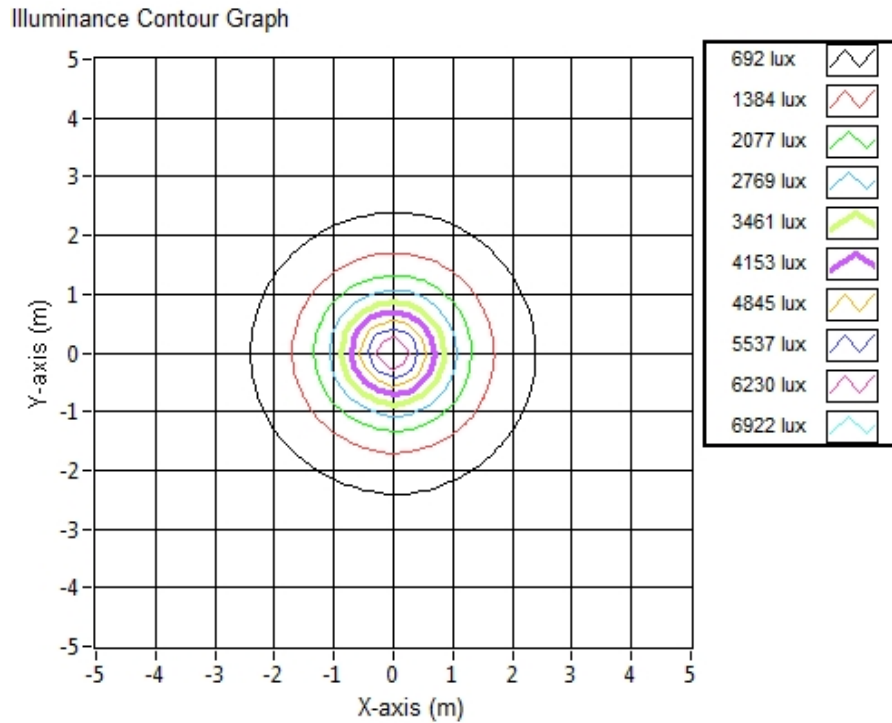
Polar Plot:



Test Results: Goniometer

Results continued from previous page.

Illuminance Plot:



Illuminance-Cone of Light:

| Mounting Height (m) | Beam Cone Width (m) | Orthogonal Beam Cone Width (m) | Projected Illuminance (lux) |
|---------------------|---------------------|--------------------------------|-----------------------------|
| 3.048 | 2.06 | 2.05 | 6705.4 |
| 6.096 | 4.11 | 4.09 | 1676.4 |
| 9.144 | 6.17 | 6.14 | 745.0 |
| 12.192 | 8.22 | 8.19 | 419.1 |
| 15.24 | 10.28 | 10.24 | 268.2 |
| 18.288 | 12.34 | 12.28 | 186.3 |
| 21.336 | 14.39 | 14.33 | 136.8 |
| 24.384 | 16.45 | 16.38 | 104.8 |
| 27.432 | 18.50 | 18.43 | 82.8 |
| 30.48 | 20.56 | 20.47 | 67.1 |

Test Results: In Situ Temperature Measurement Test

Results include maximum LED chip temperature for sample number L18089.
Dialight unit model number H6x-7NCB-Kxxx-xxx

LED identified as Seoul part number SAW8C22B.

LED drive current (as indicated by customer): 43 (mA)

LED Specifications:

LED specifications are taken from LED manufacturer datasheet:

Maximum Forward Current (If): 250 (mA)
Maximum Rated Power Dissipation: 1.5 (W)
Maximum Junction Temp. (Tj): 125 (°C)
Thermal Resistance (Rth): 17 (°C/W)

Derived Specifications:

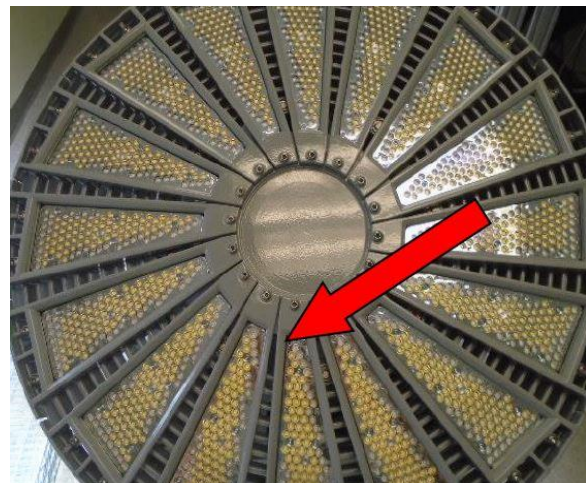
Maximum Power at Indicated Current: 0.258 (W)
Maximum Source Temperature: 120.6 (°C)

Test Conditions:

Temperature Measurement Location: See Photographs Below
Ambient Temperature: $25^{\circ} \pm 5^{\circ}$ (°C)
Ambient temperature at time of measurement: 23.9 (°C)
Relative humidity at time of measurement: 55%

Results:

Measured LED source temperature: 50.7 (°C)



Equipment Used:

| Equipment Name | Model Number |
|--|--------------|
| Omega TC | Dpi8 |
| Fluke 8808A Digit Multimeter | 8808A |
| YOKOGAWA Digital Power Meter | 11/26/3981 |
| LSI High Speed Mirror Goniometer | 6240T |
| Instrument System Spectrometer | CAS140B-151 |
| Instrument System 1.5 Meter Sphere | ISP1500 |
| Delta Elektronika DC Power Supply | SM.300-5 |
| Instek AC Power Supply | APS-9501 |
| Sorensen DC Power Supply | XHR150-7 |
| TPI Digital Thermometer | TPI 343 |
| Fluke 52II Thermometer | 068158 |
| Fluke 971 Humidity Meter | 971 |
| Volttech Power Analyzer | PM1000+ |
| Volttech Universal Breakout Box | PM1000+ |
| BK Precision | 1715A |
| Step-Up Transformer | |
| Omega TC | Dpi8-C24 |
| Agilent True RMS OLED Multimeter | U1273A |
| ITL Osram Calibraton lamps for Goniometer | J9a8 |
| ITL Osram Calibraton lamps for Goniometer | J9a8 |
| ITL Osram Calibraton lamps for Goniometer | J9a8 |
| Adaptive Power Systems AC Power Supply | FC-210 |
| Xitron Power Analyzer | XT2640 |
| GwINSTEK DC Power Supply | GEP172679 |
| Osram Sylvania Calibration Lamp for Sphere | STD-20WF-3 |

Additional Notes:

Samples are received and tested in new and undamaged condition, unless otherwise noted. The results shown in this report are representative only of the test samples submitted. This data has been issued to the assignee for further evaluation. This report shall not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. This report shall not be reproduced, except in full, without the express written permission of Dialight Optics Laboratory.

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 Dialight Optics Laboratory
 Optical Engineer
 Approved Signatory