

Test Report

Report Number: L19034

Date: May 14, 2019

Issued by:

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

Test of one Reliant High Bay
Unit manufacturer: Dialight Corporation
Unit model number: RRE-4MC2-Exxx-xxN

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: May 10, 2019 through May 14, 2019

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: L19034
Manufacturer: Dialight Corporation
Product Name: Reliant High Bay
Description: Reliant High Bay
Model Number: RRE-4MC2-Exxx-xxN

Report Summary

Sample number L19034
Dialight unit model number RRE-4MC2-Exxx-xxN

Photograph(s) of sample:



*Photographs not to scale. For reference only.

Summary of Results:

| | <u>Integrating Sphere</u> | <u>Goniophotometer</u> |
|--------------------|---------------------------|------------------------|
| Luminous Flux: | 22880 (lumens) | 22973 (lumens) |
| Electrical Power: | 159.9 (W) | 159.5 (W) |
| Luminous Efficacy: | 143.1 (lumens/W) | 144.1 (lumens/W) |

Electrical Measurements:

Input Power (230 VAC): 159.9 (W)
Power Factor (230 VAC): 0.974
Current ATHD % (230 VAC): 8.309
Input Power (110 VAC): 165.8 (W)
Power Factor (110 VAC): 0.997
Current ATHD % (110 VAC): 4.226

Color Measurements:

Correlated Color Temperature (CCT): 5109
Color Rendering Index (CRI): 86.8
Chromaticity Coordinate (x): 0.342
Chromaticity Coordinate (y): 0.352
Chromaticity Coordinate (u'): 0.209
Chromaticity Coordinate (v'): 0.323
DUV: 0.0014

Temperature Measurements:

In Situ LED Source Temperature: 49.6 (°C)

Test Results: Integrating Sphere

Results include unit color, flux, efficacy and electrical power for sample number L19034.

Dialight unit model number RRE-4MC2-Exxx-xxN

Test Conditions:

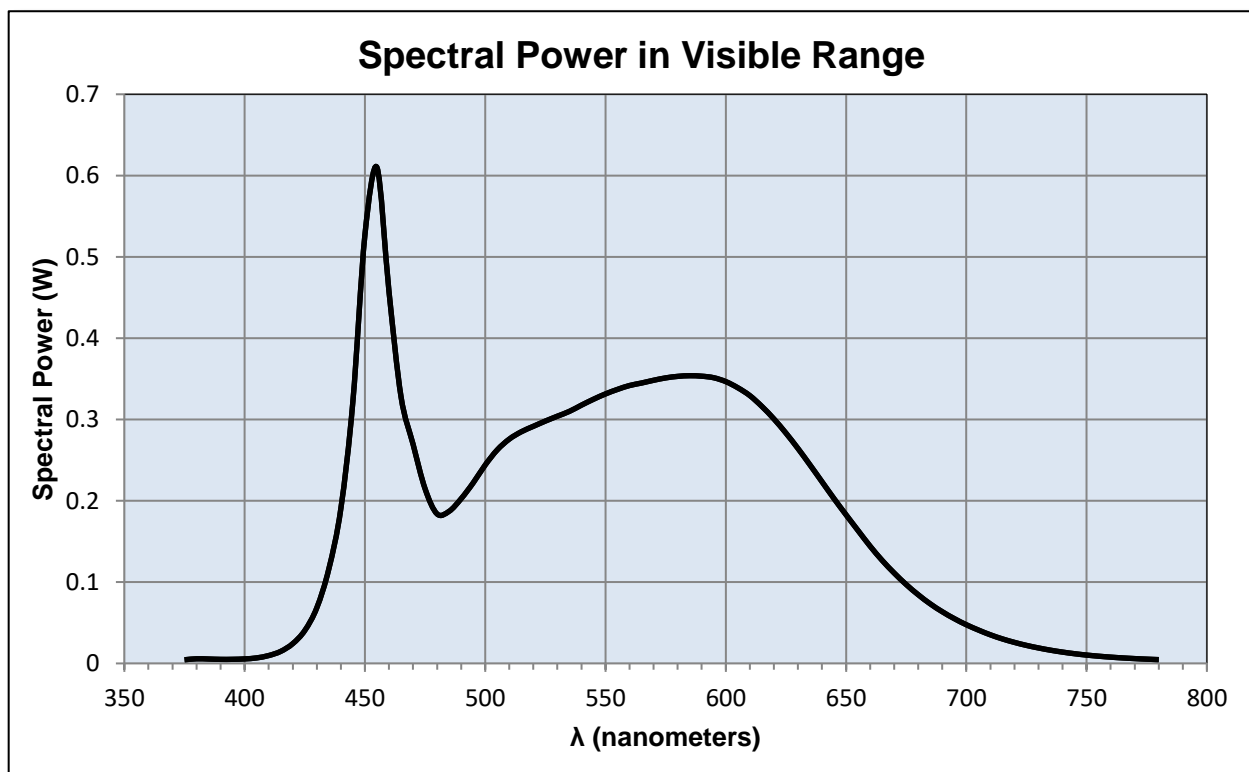
Ambient Temperature: 25 ± 1 (°C)

Electrical Measurements:

Input Voltage: 230 (VAC)
Input Current: 0.713 (A)
Input Power: 159.9 (W)
Input Power Factor: 0.974
Current ATHD: 8.309 (%)

Photometric measurements:

Luminous Flux: 22880 (lumens)
Luminous Efficacy: 143.1 (lumens/W)
Correlated Color Temperature (CCT): 5109 (K)
CRI -Ra: 86.8
CRI -R9: 24.5
DUV: 0.0014
CIE Coordinate (x): 0.342
CIE Coordinate (y): 0.352
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:

| λ (nm) | (W/nm) | λ (nm) | (W/nm) | λ (nm) | (W/nm) |
|----------------|--------|----------------|--------|----------------|--------|
| 375 | 0.005 | 515 | 0.285 | 655 | 0.163 |
| 380 | 0.006 | 520 | 0.292 | 660 | 0.144 |
| 385 | 0.005 | 525 | 0.298 | 665 | 0.127 |
| 390 | 0.005 | 530 | 0.304 | 670 | 0.111 |
| 395 | 0.005 | 535 | 0.310 | 675 | 0.097 |
| 400 | 0.006 | 540 | 0.318 | 680 | 0.084 |
| 405 | 0.007 | 545 | 0.325 | 685 | 0.073 |
| 410 | 0.010 | 550 | 0.331 | 690 | 0.064 |
| 415 | 0.015 | 555 | 0.337 | 695 | 0.055 |
| 420 | 0.024 | 560 | 0.342 | 700 | 0.048 |
| 425 | 0.040 | 565 | 0.345 | 705 | 0.041 |
| 430 | 0.068 | 570 | 0.348 | 710 | 0.035 |
| 435 | 0.116 | 575 | 0.351 | 715 | 0.030 |
| 440 | 0.191 | 580 | 0.353 | 720 | 0.026 |
| 445 | 0.322 | 585 | 0.354 | 725 | 0.022 |
| 450 | 0.527 | 590 | 0.353 | 730 | 0.019 |
| 455 | 0.610 | 595 | 0.351 | 735 | 0.016 |
| 460 | 0.458 | 600 | 0.347 | 740 | 0.014 |
| 465 | 0.328 | 605 | 0.339 | 745 | 0.012 |
| 470 | 0.270 | 610 | 0.329 | 750 | 0.010 |
| 475 | 0.215 | 615 | 0.316 | 755 | 0.009 |
| 480 | 0.184 | 620 | 0.301 | 760 | 0.008 |
| 485 | 0.187 | 625 | 0.283 | 765 | 0.007 |
| 490 | 0.203 | 630 | 0.264 | 770 | 0.006 |
| 495 | 0.222 | 635 | 0.244 | 775 | 0.005 |
| 500 | 0.244 | 640 | 0.223 | 780 | 0.005 |
| 505 | 0.263 | 645 | 0.203 | | |
| 510 | 0.276 | 650 | 0.183 | | |

Test Results: Goniometer

Results include unit flux, distribution, efficacy, and electrical power for sample number L19034.
Dialight unit model number RRE-4MC2-Exxx-xxN

Electrical Measurements:

Input Voltage: 230 (VAC)
Input current: 0.714 (A)
Input Power: 159.5 (W)
Power Factor: 0.97

Photometric measurements:

Absolute Luminous Flux: 22973 (lumens)
Luminous Efficacy: 144.1 (lumens/W)

Intensity Summary:

| <u>INTENSITY (CANDLEPOWER) SUMMARY</u> | | | | | | |
|--|-------|------|------|------|--------|---------------|
| ANGLE | ALONG | 23 | 45 | 67.5 | ACROSS | OUTPUT LUMENS |
| 0 | 8758 | 8758 | 8758 | 8758 | 8758 | |
| 5 | 8718 | 8718 | 8718 | 8718 | 8718 | 326 |
| 15 | 8686 | 8686 | 8686 | 8686 | 8686 | 1854 |
| 25 | 9091 | 9091 | 9091 | 9091 | 9091 | 3537 |
| 35 | 9320 | 9320 | 9320 | 9320 | 9320 | 5303 |
| 45 | 7305 | 7305 | 7305 | 7305 | 7305 | 5932 |
| 55 | 3665 | 3665 | 3665 | 3665 | 3665 | 4340 |
| 65 | 563 | 563 | 563 | 563 | 563 | 1415 |
| 75 | 102 | 102 | 102 | 102 | 102 | 203 |
| 85 | 32 | 32 | 32 | 32 | 32 | 58 |
| 95 | 0 | 0 | 0 | 0 | 0 | 5 |
| 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 |

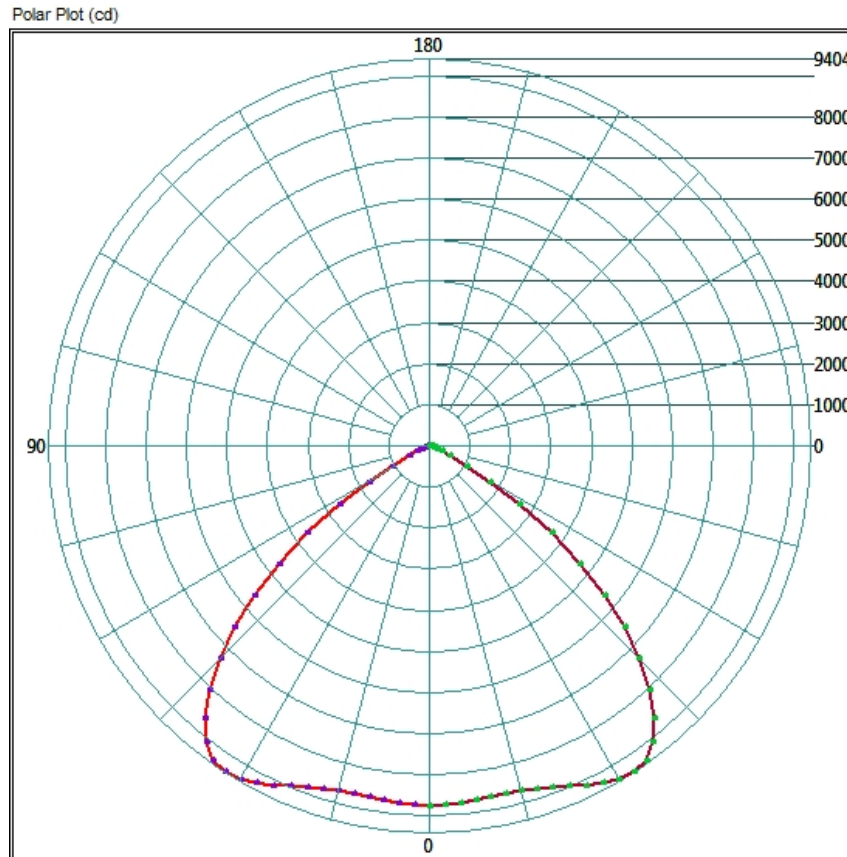
ZONAL LUMEN AND PERCENTAGES

| ZONE | LUMENS | % LUMINAIRE |
|--------|----------|-------------|
| 0-30 | 8169.12 | 35.6% |
| 0-40 | 14051.36 | 61.2% |
| 0-60 | 22314.72 | 97.1% |
| 60-90 | 1070.24 | 4.7% |
| 0-90 | 22973.28 | 100.0% |
| 90-180 | 0 | 0.0% |
| 0-180 | 22973.28 | 100.0% |

Test Results: Goniometer

Results continued from previous page.

Polar Plot:

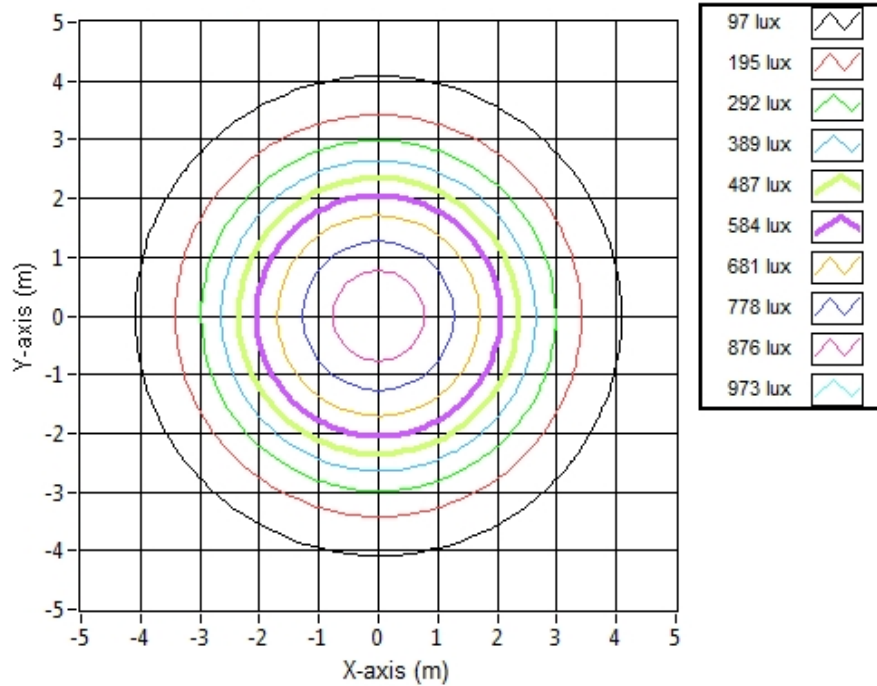


Test Results: Goniometer

Results continued from previous page.

Illuminance Plot:

Illuminance Contour Graph



Illuminance-Cone of Light:

| Mounting Height (m) | Beam Cone Width (m) | Orthogonal Beam Cone Width (m) | Projected Illuminance (lux) |
|---------------------|---------------------|--------------------------------|-----------------------------|
| 3.048 | 8.16 | 8.16 | 942.7 |
| 6.096 | 16.32 | 16.32 | 235.7 |
| 9.144 | 24.48 | 24.48 | 104.7 |
| 12.192 | 32.65 | 32.65 | 58.9 |
| 15.24 | 40.81 | 40.81 | 37.7 |
| 18.288 | 48.97 | 48.97 | 26.2 |
| 21.336 | 57.13 | 57.13 | 19.2 |
| 24.384 | 65.29 | 65.29 | 14.7 |
| 27.432 | 73.45 | 73.45 | 11.6 |
| 30.48 | 81.62 | 81.62 | 9.4 |

Test Results: In Situ Temperature Measurement Test

Results include maximum LED chip temperature for sample number L19034.
Dialight unit model number RRE-4MC2-Exxx-xxN

LED identified as Seoul Semiconductor part number SAW8C22B.

LED drive current (as indicated by customer): 38.11 (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:

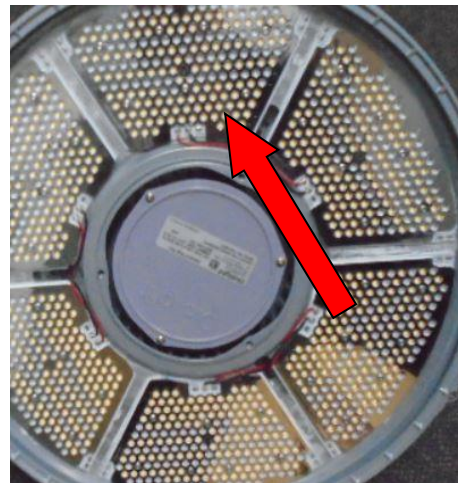
| | | |
|-------------------------------------|-------|------|
| Maximum Power at Indicated Current: | 0.229 | (W) |
| Maximum Source Temperature: | 121.1 | (°C) |

Test Conditions:

| | |
|---|-----------------------|
| Temperature Measurement Location: | See Photographs Below |
| Ambient Temperature: | 25° ± 5' (°C) |
| Ambient temperature at time of measurement: | 24.1 (°C) |
| Relative humidity at time of measurement: | 35% |

Results:

Measured LED source temperature: 49.6 (°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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 Optical Engineer
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