

Report of Test LL15633

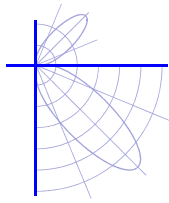
Indice Ecotech, 50 mm dia. (nom.) "MR16" LED Lamp. Product ID: LED Mini Ultra MR16.
Bipin cast aluminium housing with vertical heat dissipating slots. Overall dimensions of 50 x 50 mm dia.
(nom.). Specular face ring with central conical reflector ~10 mm deep, luminous opening of 19 mm dia.
(nom.). Tested at 12 Vac 50Hz. Measured 600 mA, efficacy of 67.1 lm/W.



Performance Summary

| | |
|---------------|--------|
| Luminous flux | 438 lm |
| Lamp Power | 6.53 W |
| SHR Nominal | 0.75 |
| SHR Maximum | 0.90 |

PREPARED FOR : Indice Ecotech, Richmond, VIC. 3121.

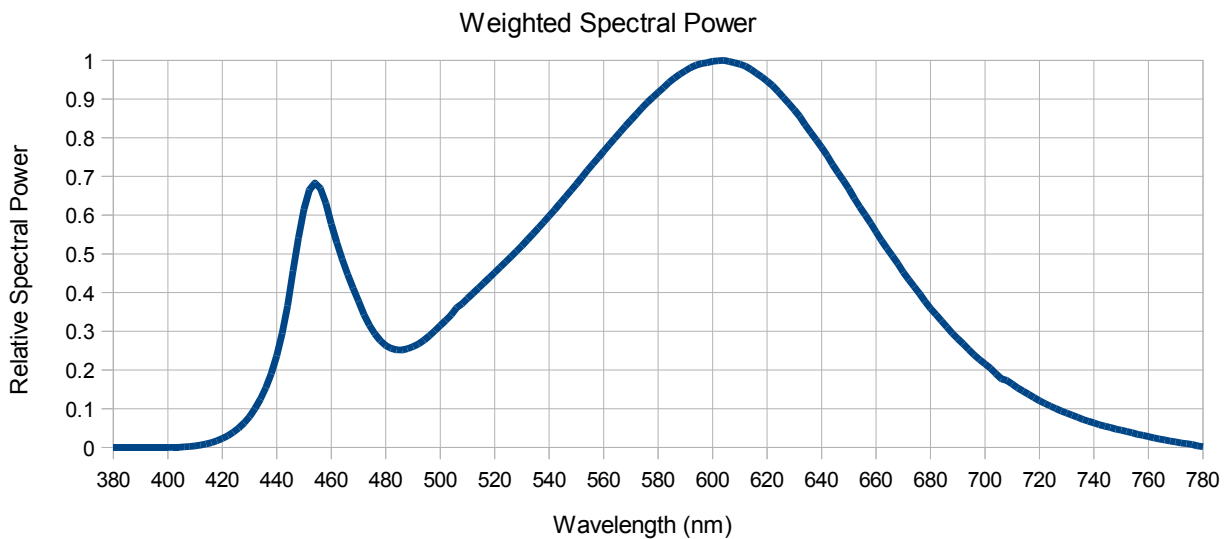


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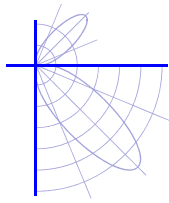
Performance data in accordance with IESNA LM-79 : 2008

| | | |
|-------------------|--|----------------|
| Photometry | Total Luminous Flux | 438 lm |
| | Luminous efficacy | 67.1 lm/W |
| Electrical | Voltage | 12 V |
| | Frequency | 50 Hz |
| | Current | 0.60 A |
| | Power | 6.53 W |
| | Power Factor | 0.91 |
| Spectral | CIE 1931 2 deg observer (x, y) ⁽¹⁾ | (0.423, 0.390) |
| | CIE 1976 2 deg observer (u', v') ⁽¹⁾ | (0.248, 0.513) |
| | Correlated Colour Temperature (CCT) ⁽¹⁾ | 3130 K |
| | Colour Rendering Index (CRI) ⁽¹⁾ | 83 |
| | Colour Spatial Uniformity ⁽²⁾ | 0.0064 |
| | Scotopic/Photopic Ratio ^{(1),(3)} | 1.42 |



* The spectral power graph combines the weighted spectral power distributions of all spatial measurements.

- (1) Value is computed from the weighted average of the spatial measurements
- (2) Value is the maximum deviation of the spatial u' and v' measurements from the weighted average
- (3) Quantity is in addition to the scope of IESNA LM-79:2008



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Spatial measurements (lower hemisphere)

| Gamma angle (deg) | CIE 1976 (u',v' coordinates) | |
|-------------------|------------------------------|----------------|
| | C0 plane | C90 plane |
| 0 | (0.245, 0.509) | (0.244, 0.508) |
| 10 | (0.246, 0.512) | (0.246, 0.512) |
| 20 | (0.246, 0.512) | (0.247, 0.512) |
| 30 | (0.249, 0.515) | (0.250, 0.516) |
| 40 | (0.248, 0.514) | (0.249, 0.515) |
| 50 | I <= 10 % | I <= 10 % |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |

Spatial measurements (upper hemisphere)

| Gamma angle (deg) | CIE 1976 (u',v' coordinates) | |
|-------------------|------------------------------|---------|
| | C plane | C plane |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |

Test procedure

All measurements were performed in an environmentally controlled laboratory employing suitable baffling to minimise stray light. The sample was mounted in its normal operating orientation on a rotating mirror goniophotometer and operated from a stabilised supply. The photometric output was monitored and measurements were performed once stability was achieved.

The goniophotometer was used to measure the spatial distribution of both luminous intensity and, in conjunction with a spectroradiometer and spectrally flat reflectance tile, spectral irradiance. The distribution locus comprises points in the C0 and C90 planes at 10° gamma intervals from 0. The CIE (x,y) coordinates and other derived metrics (CIE (u', v'), CCT and CRI) are calculated from the weighted sum (weighted for intensity and represented solid angle) of the measured spectral irradiances.

| | | | |
|--------------------|---------------|----------------------|----------|
| Sample orientation | Beam downward | Stabilisation time | 3 hour |
| | | Total operation time | 4.5 hour |

Equipment and uncertainties

A C-gamma rotating mirror goniophotometer with a test distance of 8 m.

| | | | |
|---------------------|---------|-------------------|--------|
| luminous intensity* | ± 5 % | temperature* | ± 1 °C |
| C, gamma angles* | ± 0.25° | luminous efficacy | ± 5 % |

A PhotoResearch PR-670 spectroradiometer (380 - 780 nm., 2 nm. per pixel) measuring from a spectrally flat reflectance tile attached to goniophotometer arm at a distance from sample >5 times the maximum observed luminous opening dimension.

| | | | |
|------------------------------|----------|---------------------------|---------|
| CIE (x, y) coordinates* | ± 0.003 | CCT* | ± 100 K |
| CIE (u', v') coordinates | ± 0.003 | CRI | ± 3 |
| Δ (u', v') colour difference | ± 0.0007 | Scotopic / photopic ratio | 0.02 |

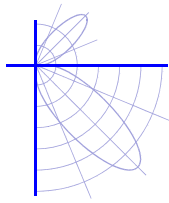
A Yokogawa WT210 power meter connected in circuit to the sample electrical supply

| | | | |
|----------|---------|--------------|----------|
| voltage* | ± 0.1 % | frequency | ± 0.1 Hz |
| current* | ± 0.1 % | power* | ± 0.5 % |
| | | power factor | ± 0.01 |

Accreditation & traceability

The laboratory is NATA accredited to ISO17025 : 2005 (details at www.nata.asn.au). The laboratory registration covers measurement and calculation of quantities indicated by *. Uncertainties calculated for this sample are at the 95% confidence interval with coverage factor k = 2 for measured and calculated quantities. All measurements are traceable through the Australian National Measurement Institute to International standards.

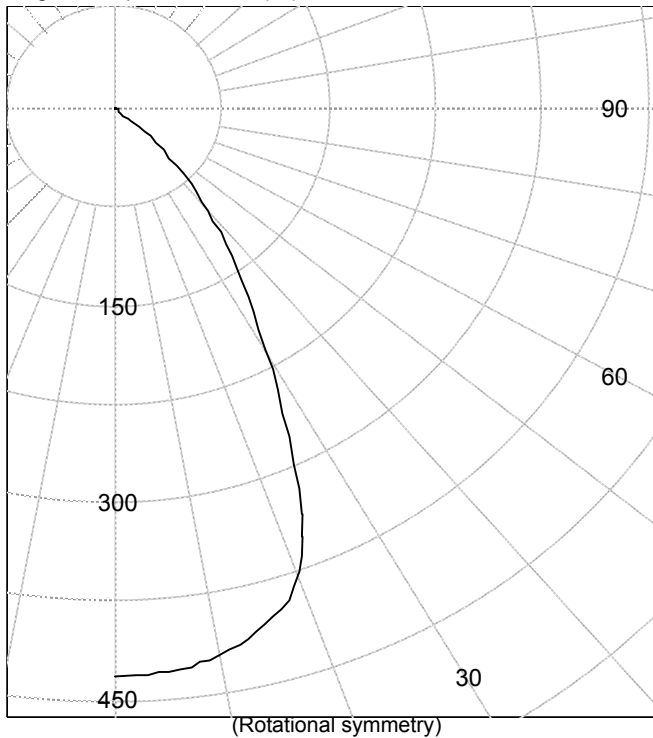
IESNA LM-79 : 2008 Calculator v3.2 (14th May 2012)



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Legend: All planes - Solid (cd)



AVERAGE LUMINANCE (cd / sq.m)

| Gamma | C0 |
|-------|--------|
| 45.0 | 302274 |
| 55.0 | 30023 |
| 65.0 | 2835 |
| 75.0 | 1478 |
| 85.0 | 2495 |

INTENSITY SUMMARY (cd)

| Gamma | All Planes | Flux (lm) | Gamma | C0 | Flux (lm) |
|-------|------------|-----------|-------|----|-----------|
| 0 | 434 | | 90 | 0 | |
| 5 | 432 | 41 | 95 | 0 | 0 |
| 10 | 423 | | 100 | 0 | |
| 15 | 408 | 114 | 105 | 0 | 0 |
| 20 | 377 | | 110 | 0 | |
| 25 | 300 | 135 | 115 | 0 | 0 |
| 30 | 211 | | 120 | 0 | |
| 35 | 149 | 93 | 125 | 0 | 0 |
| 40 | 101 | | 130 | 0 | |
| 45 | 61 | 47 | 135 | 0 | 0 |
| 50 | 26 | | 140 | 0 | |
| 55 | 5 | 7 | 145 | 0 | 0 |
| 60 | 1 | | 150 | 0 | |
| 65 | 0 | 0 | 155 | 0 | 0 |
| 70 | 0 | | 160 | 0 | |
| 75 | 0 | 0 | 165 | 0 | 0 |
| 80 | 0 | | 170 | 0 | |
| 85 | 0 | 0 | 175 | 0 | 0 |
| 90 | 0 | | 180 | 0 | |

ZONAL FLUX AND PERCENTAGES

| Zone | Flux (lm) | %Lamp | %Luminaire |
|--------|-----------|-------|------------|
| 0-30 | 290 | N / A | 66.3 |
| 0-40 | 384 | N / A | 87.6 |
| 0-60 | 437 | N / A | 99.9 |
| 0-90 | 438 | N / A | 100.0 |
| 40-90 | 54 | N / A | 12.4 |
| 60-90 | 1 | N / A | 0.1 |
| 90-180 | 0 | N / A | 0.0 |
| 0-180 | 438 | N / A | 100.0 |

Light Output Ratio = N / A

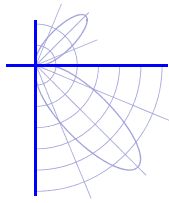
SHR-NOM = 0.75
SHR-MAX = 0.90

Calculated using the TM5
fine grid method.

CERTIFIED BY:

Kevin Monaghan
Authorised Signatory

Date of test 13-Jul-2012
Date of report 23-Jul-2012

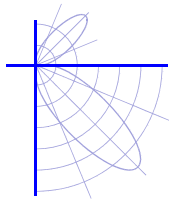


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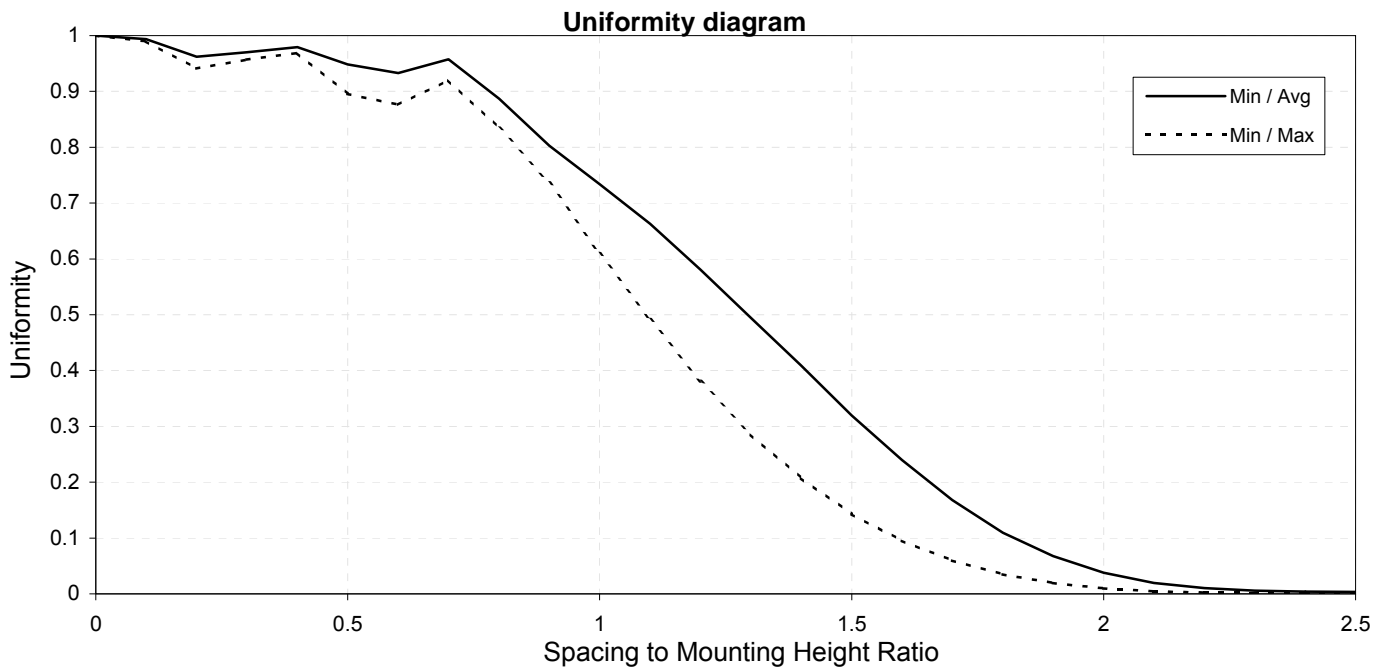
Intensity (cd) and Flux (lm) data

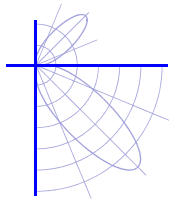
| Gamma | Intensity | Flux | Gamma | Intensity | Flux |
|-------|-----------|------|-------|-----------|------|
| 0.0 | 434 | | 90.0 | 0 | |
| 2.5 | 433 | | 92.5 | 0 | |
| 5.0 | 432 | 41 | 95.0 | 0 | |
| 7.5 | 428 | | 97.5 | 0 | 0 |
| 10.0 | 423 | | 100.0 | 0 | |
| 12.5 | 417 | | 102.5 | 0 | |
| 15.0 | 408 | 114 | 105.0 | 0 | |
| 17.5 | 396 | | 107.5 | 0 | 0 |
| 20.0 | 377 | | 110.0 | 0 | |
| 22.5 | 344 | | 112.5 | 0 | |
| 25.0 | 300 | 135 | 115.0 | 0 | |
| 27.5 | 252 | | 117.5 | 0 | 0 |
| 30.0 | 211 | | 120.0 | 0 | |
| 32.5 | 177 | | 122.5 | 0 | |
| 35.0 | 149 | 93 | 125.0 | 0 | |
| 37.5 | 124 | | 127.5 | 0 | 0 |
| 40.0 | 101 | | 130.0 | 0 | |
| 42.5 | 80 | | 132.5 | 0 | |
| 45.0 | 61 | 47 | 135.0 | 0 | |
| 47.5 | 43 | | 137.5 | 0 | 0 |
| 50.0 | 26 | | 140.0 | 0 | |
| 52.5 | 13 | | 142.5 | 0 | |
| 55.0 | 5 | 7 | 145.0 | 0 | |
| 57.5 | 1 | | 147.5 | 0 | 0 |
| 60.0 | 1 | | 150.0 | 0 | |
| 62.5 | 0 | | 152.5 | 0 | |
| 65.0 | 0 | 0 | 155.0 | 0 | |
| 67.5 | 0 | | 157.5 | 0 | 0 |
| 70.0 | 0 | | 160.0 | 0 | |
| 72.5 | 0 | | 162.5 | 0 | |
| 75.0 | 0 | 0 | 165.0 | 0 | |
| 77.5 | 0 | | 167.5 | 0 | 0 |
| 80.0 | 0 | | 170.0 | 0 | |
| 82.5 | 0 | | 172.5 | 0 | |
| 85.0 | 0 | 0 | 175.0 | 0 | |
| 87.5 | 0 | | 177.5 | 0 | 0 |
| 90.0 | 0 | | 180.0 | 0 | |



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Test Distance: 8.0 metres
Test Temperature: 24.8 degrees Celsius

Significance: This laboratory has no control over the selection of samples to be tested. All testing is performed on the understanding that the significance of the report is limited to the extent that the test sample is representative of production units.

Special Notes: The intensity values contained in this report are shown as tested. When using these values in calculations the appropriate Ballast Factor and Manufacturer's rated lumens MUST be taken into account.

It should also be noted that prorating the lumen output for the use of other lamp/ballast combinations, or for use in different environmental conditions, than that tested may produce erroneous results.

The generic term "LOR" is used in this report, it denotes the "Light Output Ratio Luminaire" as defined in Australian Standard AS1680, Part 3, 1991, Section 1.3.9.

This report is free of erasures and corrections.

Photometric intensity values are reported using the CIE Cgamma coordinate system as described in CIE Publication number 121.

Uncertainties: At the 95% confidence interval with a factor k = 2, the uncertainties for this report are :-

| | |
|----------------------|----------------------|
| Temperature | +/- 1 degree Celsius |
| Light Output Ratio | +/- 4% |
| Luminous Intensity | +/- 4% |
| Angular displacement | +/- 0.25 degrees. |

Testing Procedure: Tested in accordance with the applicable sections of CIE Publication Number 121; and with reference to Australian Standard AS1680, Part 3, 1991.