# Photometric Test Report

## Relevant Standards

☑IES LM-79-2008
☑ANSI C82.77:2014

## Prepared For

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**Project Number**
**DLF1811113**

**Data Number**
**DLF1811113-13a**

**Test Date**
**2018/11/22**

**Issue Date**
**2018/11/23**

| **Prepared By** | **Approved By** |
|---|---|
| Wangzun Zhu | Kevin Jia |

## 1.0 Test Summary

DLC Technical Requirements v4.4

| Outdoor - High output<br>Outdoor Pole/Arm-Mounted Area and Roadway Luminaires | | | |
|---|---|---|---|
| **Requirement Category** | **Test Method** | **Requirements** | **Test value** |
| Lamp Output (lm) | IES LM-79-2008 | 10000 | 10690 |
| Minimum Luminaire Efficacy (lm/W) | IES LM-79-2008 | 100 | 107.3 |
| Zonal Lumen Requirement (0°-90°) | IES LM-79-2008 | ⩾99% | 100.00% |
| Zonal Lumen Requirement (80°-90°) | IES LM-79-2008 | ⩽10% | 2.76% |
| Alowable CCTs* (K) | IES LM-79-2008 | ⩽5700 | 3011 |
| Minimum CRI | IES LM-79-2008<br>CIE 13.3-1995 | ⩾65 | 79.3 |
| Power Factor | ANSI C82.77:2014 | 0.873 | 0.962 |
| Total Harmonic Distortion (A%) | ANSI C82.77:2014 | 25.00% | 12.78% |

## 2.0 Test List

| Test Item | Test | Test Date | Model Number | Sample No. |
|---|---|---|---|---|
| 1 | Integrating Sphere Test | 2018/11/22 | IVAT2-100L730[H, 4] | M1 |
| 2 | Goniophotometer Test | 2018/11/22 | IVAT2-100L730[H, 4] | M1 |
| 3 | THD and PF Test | 2018/11/22 | IVAT2-100L730[H, 4] | M1 |

| **Remark(If any)** |
|---|
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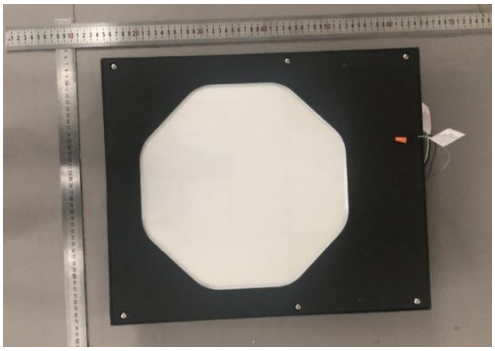
| 2、The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification. |

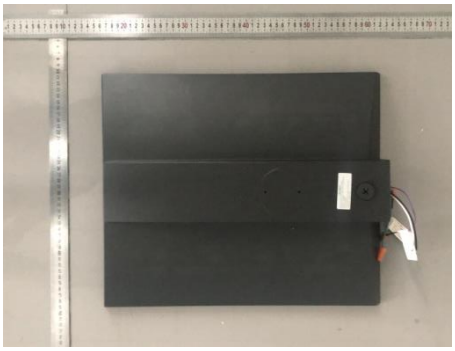
# 3.0 Production Description

**Luminaire Description:** IVAT2-100L730[H, 4]

**Electrical Specification:** 480V,50/60HZ, 100W

**Photos of Luminaire Characteristics**





# 4.0 LM-79 Measurement and Test Results

## 4.1 Integrating Sphere Test

| | | | |
|---|---|---|---|
| Model No. | IVAT2-100L730[H, 4] | Sample ID. | M1 |
| Opreate time (Min.) | 90 | Stabilization time (Min.) | 45 |

| **Test Method** |
|---|
| The samples were tested according to the IES LM-79-2008.<br><br>Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C.<br><br>The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere.<br><br>The voltage of an AC power supply (RMS voltage) or DC power supply (instantaneous voltage) applied to the device under test shall be regulated to within ±0.2 percent under load.<br><br>The sample was measured using 4π geometry and operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm. |

Test Conditions

| Temperature (°C) | Voltage (Vac) | Frequency (Hz) | Current (A) | Power (W) | Power Factor |
|---|---|---|---|---|---|
| 25.3 | 480.07 | 60 | 0.216 | 99.7 | 0.962 |

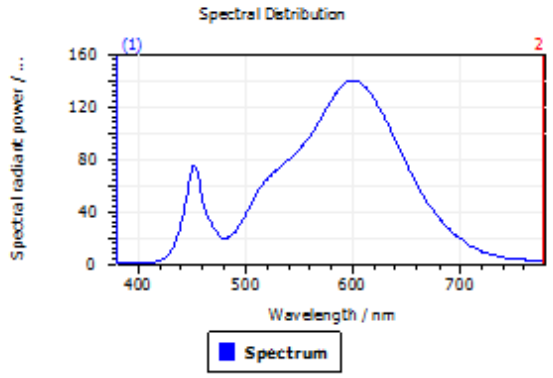
Test Result

| CCT (K) | CRI (Ra) | Duv |
|---|---|---|
| 3011 | 79.3 | 1.6E-03 |

## 4.1 Integrating Sphere Test

# Spectroradiometric Parameters

**Results**




Spectral Distribution

**Spectral values**

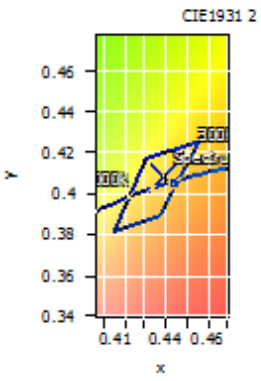
| | |
|---|---|
| DominantWavelength | 582.23 nm |
| Purity | 0.543 |
| PeakWavelength | 600.39 nm |
| Width50%: | 127.96 nm |

**Color Coordinates**

| | | | | | |
|---|---|---|---|---|---|
| Correlated Color Temperatu | | 3011 K | | | |
| x: | 0.4384 | u: | 0.2496 | u': | 0.2496 |
| y: | 0.4086 | v: | 0.3489 | v': | 0.5234 |

| | | | |
|---|---|---|---|
| CRI01 | 76.7 | CRI09 | -6.0 |
| CRI02 | 87.5 | CRI10 | 71.4 |
| CRI03 | 96.3 | CRI11 | 75.5 |
| CRI04 | 77.2 | CRI12 | 61.9 |
| CRI05 | 76.6 | CRI13 | 79.0 |
| CRI06 | 84.2 | CRI14 | 98.2 |
| CRI07 | 81.7 | CRI15 | 68.5 |
| CRI08 | 54.2 | CRI16 | 66.5 |

ResultsCRI 79.3




PlanckDistance 1.6E-003

# 4.0 LM-79 Measurement and Test Results

## 4.3 Goniophotometer Test

| | | | |
|---|---|---|---|
| Model No. | IVAT2-100L730[H, 4] | Sample ID. | M1 |
| Opreate time (Min.) | 90 | Stabilization time (Min. | 45 |

| **Test Method** |
|---|
| The samples were tested according to the IES LM-79-2008. |
| Photometric paramters were measured using a type C goniophotometer and software. |
| The ambient temperature shall be maintained at 25° C ± 1° C, measured at a point not more than 1 m from the sample and at the same height as the sample. |
| The voltage of an AC power supply (RMS voltage)or DC power supply (instantaneous voltage) applied to the device under test shall be regulated to within ±0.2 percent under load. |
| The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at $0.5^{o}$ vertical intervals and $10^{o}$ horizontal intervals. |

Test Conditions

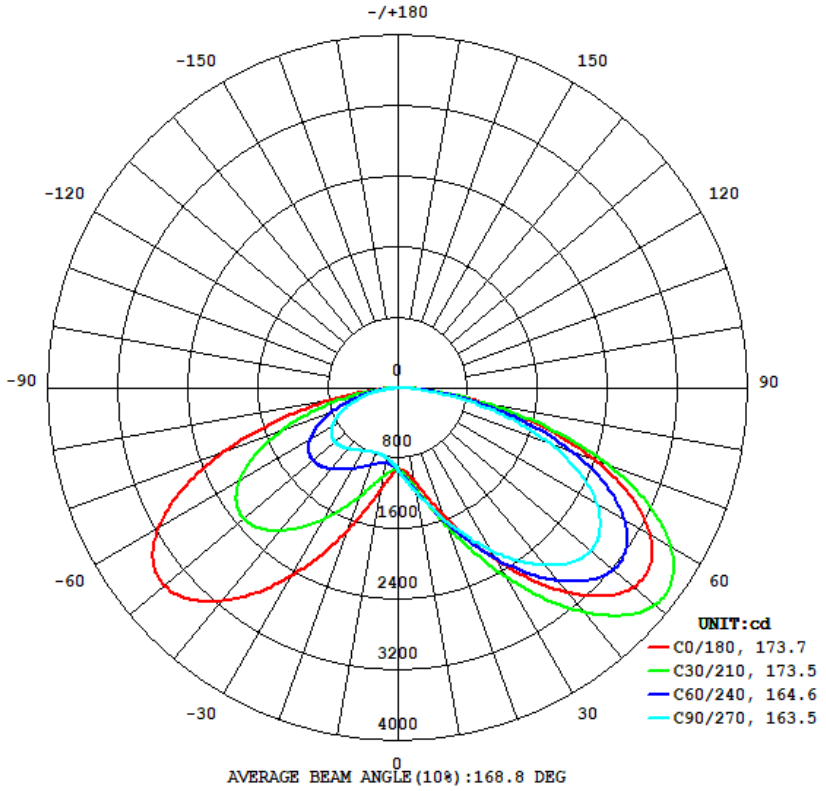
| Temperature (° C) | Voltage (Vac) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | Orientation |
|---|---|---|---|---|---|---|
| 25.1 | 479.99 | 60 | 0.216 | 99.6 | 0.962 | Light Down |

Test Result

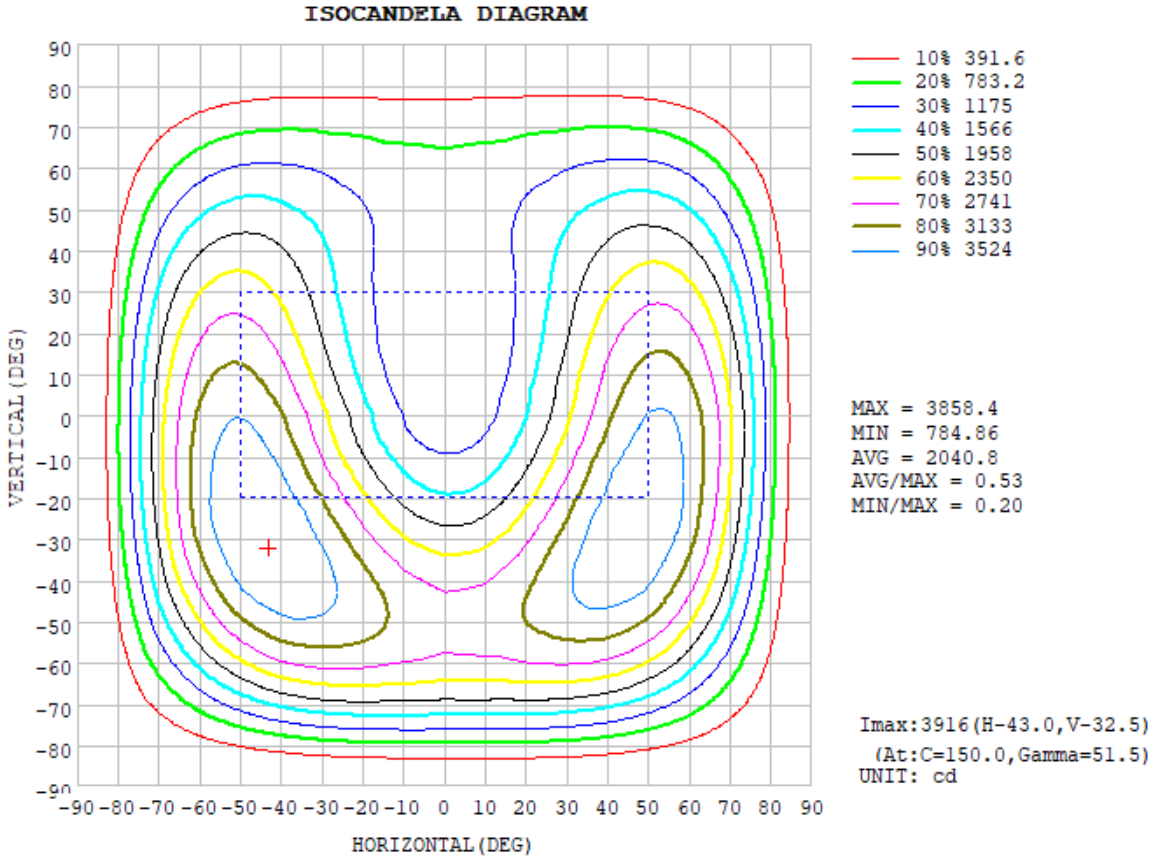
| Flux (lm) | Zonal Lumen Requirement (0°-90°) | Zonal Lumen Requirement (80°-90°) | Field Angle(10%) | | Beam Angle(50%) | | Luminous Efficacy (lm/W) |
|---|---|---|---|---|---|---|---|
| | | | Horizontal Spread | Vertical Spread | Horizontal Spread | Vertical Spread | |
| 10690 | 100.00% | 2.76% | 173.7 | 163.5 | 165.9 | 57.4 | 107.3 |

## 4.3 Goniophotometer Test

Light Distrubtion Curve




Isolux Plot



## 4.3 Goniophotometer Test

Zonal Lumen Summary

| DEG | LUMINOUS INTENSITY:cd | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| γ | C0 | C45 | C90 | C135 | C180 | C225 | C270 | C315 |
| 10 | 1066 | 1167 | 1197 | 1220 | 1169 | 938.3 | 810.1 | 909.0 |
| 20 | 1535 | 1667 | 1600 | 1805 | 1722 | 1101 | 786.7 | 1071 |
| 30 | 2246 | 2380 | 2128 | 2592 | 2455 | 1349 | 829.6 | 1344 |
| 40 | 3029 | 3136 | 2631 | 3358 | 3154 | 1600 | 907.5 | 1622 |
| 50 | 3513 | 3586 | 2876 | 3747 | 3486 | 1716 | 951.7 | 1757 |
| 60 | 3334 | 3367 | 2630 | 3457 | 3162 | 1557 | 872.2 | 1605 |
| 70 | 2397 | 2389 | 1847 | 2412 | 2130 | 1087 | 622.1 | 1133 |
| 80 | 972.7 | 939.3 | 739.2 | 909.3 | 734.6 | 419.0 | 254.0 | 448.0 |
| 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 180 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

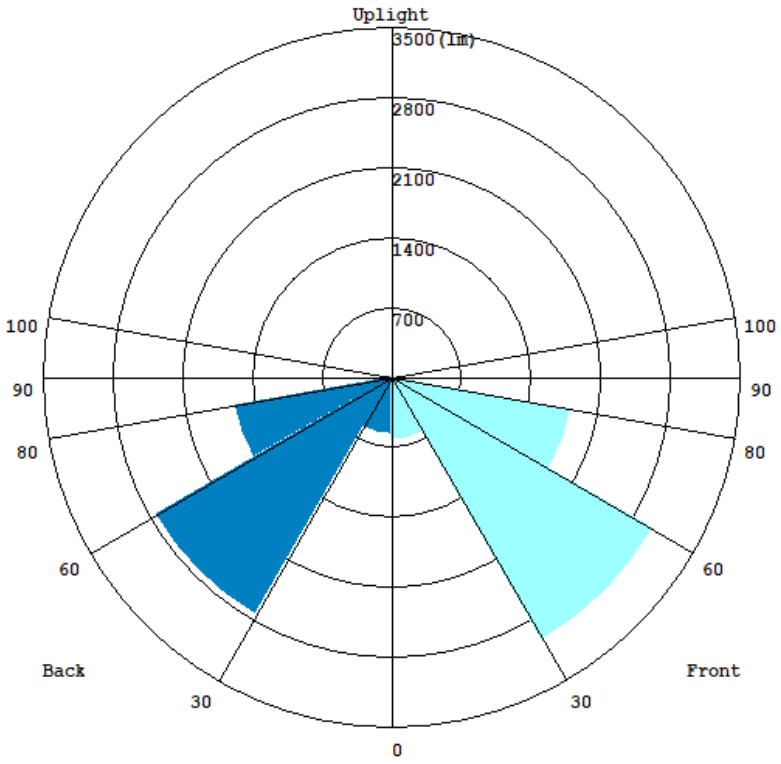
## 4.3 Goniophotometer Test

ZONAL LUMEN SUMMARY

| | Zonal (lm) | | Total (lm) | Percent |
|---|---|---|---|---|
| 0-10 | 95.15 | 0 - 10 | 95.15 | 0.89% |
| 10-20 | 350.44 | 0 - 20 | 445.59 | 4.17% |
| 20-30 | 772.52 | 0 - 30 | 1218.11 | 11.39% |
| 30-40 | 1373.93 | 0 - 40 | 2592.04 | 24.25% |
| 40-50 | 2009.68 | 0 - 50 | 4601.72 | 43.05% |
| 50-60 | 2365.25 | 0 - 60 | 6966.97 | 65.17% |
| 60-70 | 2138.30 | 0 - 70 | 9105.27 | 85.17% |
| 70-80 | 1290.48 | 0 - 80 | 10395.75 | 97.24% |
| 80-90 | 294.64 | 0 - 90 | 10690.39 | 100.00% |
| 90-100 | 0.00 | 0 - 100 | 10690.39 | 100.00% |
| 100-110 | 0.00 | 0 - 110 | 10690.39 | 100.00% |
| 110-120 | 0.00 | 0 - 120 | 10690.39 | 100.00% |
| 120-130 | 0.00 | 0 - 130 | 10690.39 | 100.00% |
| 130-140 | 0.00 | 0 - 140 | 10690.39 | 100.00% |
| 140-150 | 0.00 | 0 - 150 | 10690.39 | 100.00% |
| 150-160 | 0.00 | 0 - 160 | 10690.39 | 100.00% |
| 160-170 | 0.00 | 0 - 170 | 10690.39 | 100.00% |
| 170-180 | 0.00 | 0 - 180 | 10690.39 | 100.00% |

## 3.2 Goniophotometer Test

LCS Graph




BUG-Rating

IESNA Luminaire Flux Distribution Table:

| Zone | Lumens | Luminaire % |
|---|---|---|
| FL - Front-Low(0-30) | 636.76 | 6.0 |
| FM - Front-Medium(30-60) | 3032.5 | 28.3 |
| FH - Front-High(60-80) | 1842.3 | 17.2 |
| FVH - Front-Very High(80-90) | 153.82 | 1.4 |
| Total Forward Light | 5665.4 | 52.9 |

| | | |
|---|---|---|
| BL - Back-Low(0-30) | 582.73 | 5.4 |
| BM - Back-Medium(30-60) | 2737.9 | 25.6 |
| BH - Back-High(60-80) | 1598 | 14.9 |
| BVH - Back-Very High(80-90) | 117.89 | 1.1 |
| Total Back Light | 5036.5 | 47.1 |

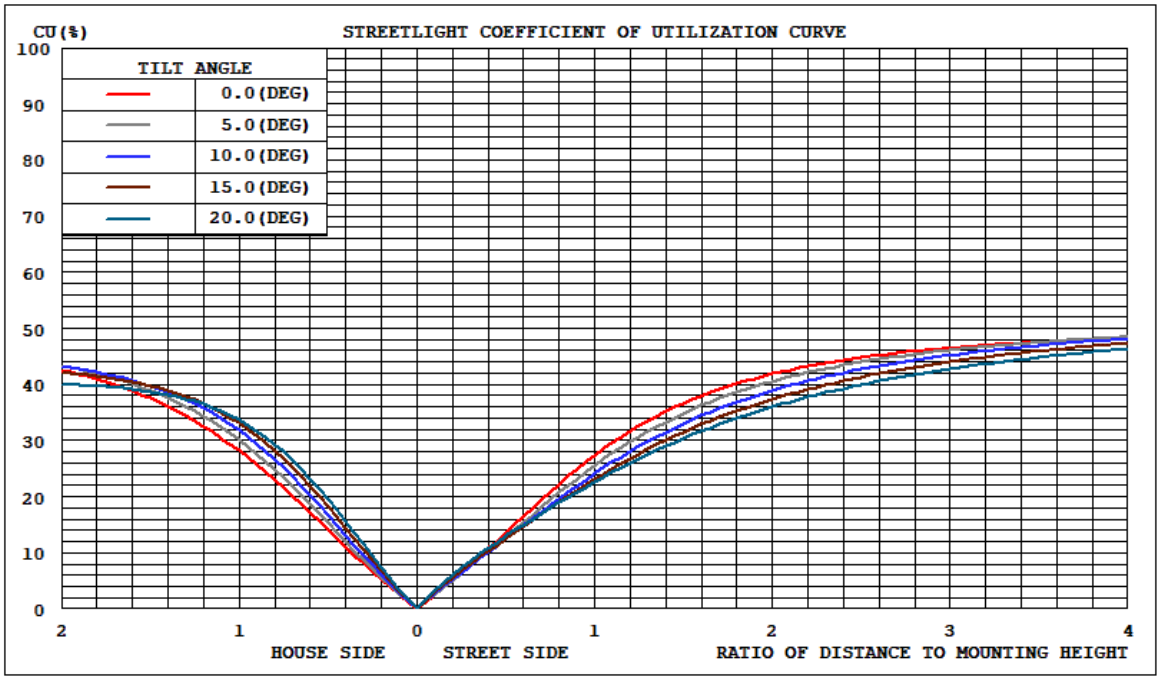
| | | |
|---|---|---|
| UL - Uplight-Low(90-100) | 0 | 0.0 |
| UH - Uplight-High(100-180) | 0 | 0.0 |
| Total Up Light | 0 | 0.0 |

| | |
|---|---|
| BUG(Back,Up,Glare) Rating | B3-U0-G3 |

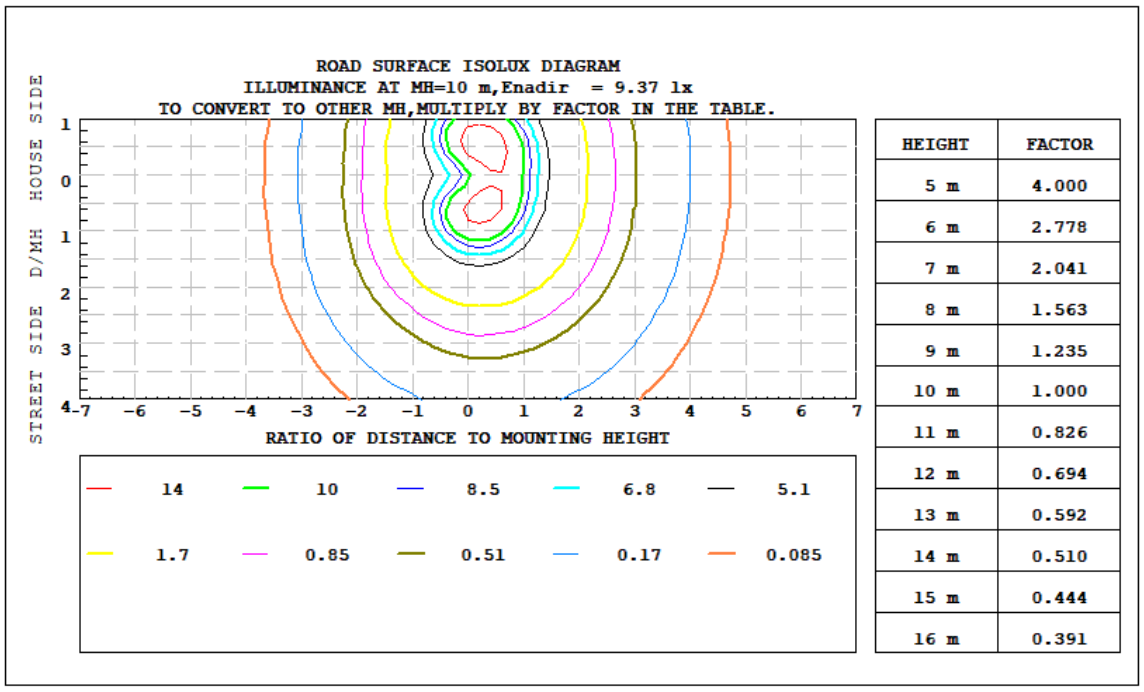
| Zone | Downward Lumens | Upward Lumens | Total Lumens |
|---|---|---|---|
| House Side | 5036.5 | 0 | 5036.5 |
| Street Side | 5665.4 | 0 | 5665.4 |

## 3.2 Goniophotometer Test

Coefficients of Utilization



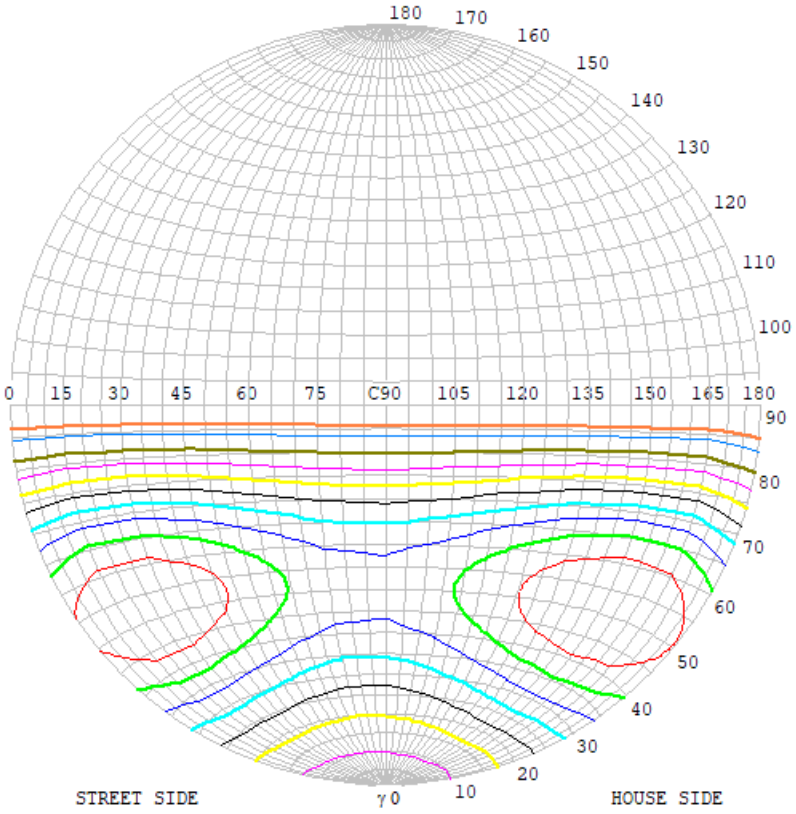

Iso-footcandle Lines of Horizontal Illumination




| HEIGHT | FACTOR |
|---|---|
| 5 m | 4.000 |
| 6 m | 2.778 |
| 7 m | 2.041 |
| 8 m | 1.563 |
| 9 m | 1.235 |
| 10 m | 1.000 |
| 11 m | 0.826 |
| 12 m | 0.694 |
| 13 m | 0.592 |
| 14 m | 0.510 |
| 15 m | 0.444 |
| 16 m | 0.391 |

## 3.2 Goniophotometer Test

STREETLIGHT ISOCANDELA DIAGRAM

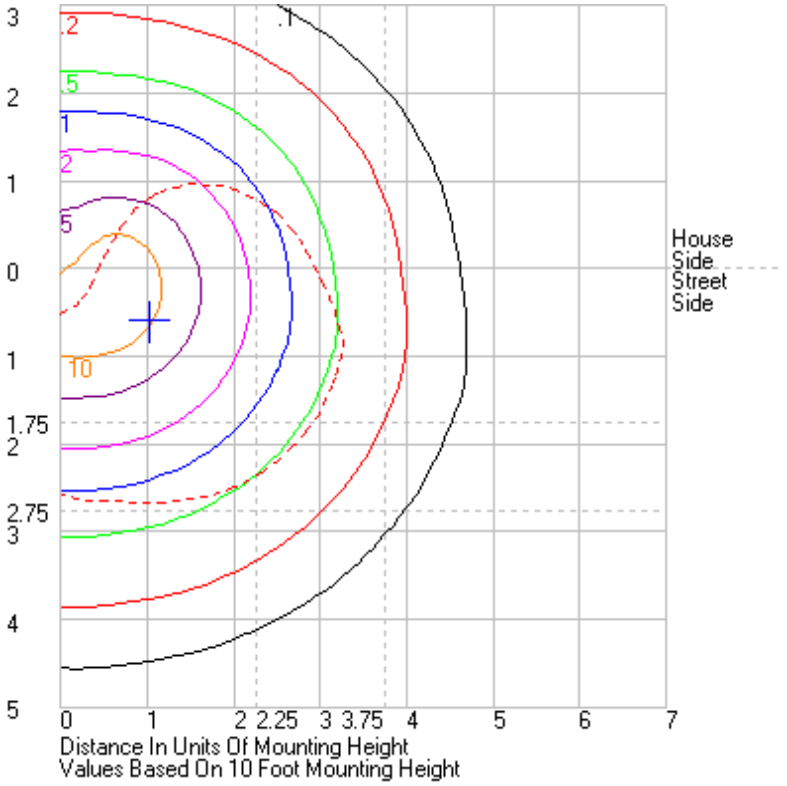



**Classification:**

**IES:Type IV - Short**
**CIE:Broad - Short**
**IES:Full cut-off**
**CIE:Semi-cut-off**
**Max.At80:95.59cd/klm**
**Max.At90:0cd/klm**
**Max.80-90:95.59cd/klm**

| ISOCANDELA DIAGRAM | |
|---|---|
| UNIT | cd |
| Imax=100% | 3927 |
| 90% | 3534 |
| 80% | 3141 |
| 70% | 2749 |
| 60% | 2356 |
| 50% | 1963 |
| 40% | 1571 |
| 30% | 1178 |
| 20% | 785 |
| 10% | 393 |
| 5% | 196 |

ROAD ISOCANDELA REPORT



# 5.0 THD and PF Test

| Model No. | IVAT2-100L730[H, 4] | Sample ID. | M1 |
|---|---|---|---|

| **Test Method** |
|---|
| The samples were tested according to the ANSI C82.77:2002.<br>The total harmonic distortion shall be measured to the 40th order.<br>The ambient temperature condition was maintained at 25º C ± 1º C. The sample measurements were made using a digital power meter and power supply. The sample was operated at rated voltage and was stabilized before measurement. The total harmonic distortion were calculated. |

Test Results

| Temperature (°C) | Voltage (Vac) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | THD |
|---|---|---|---|---|---|---|
| 25.1 | 480.07 | 60 | 0.216 | 99.7 | 0.962 | 12.78% |

## 6.0 Equipment Information

| Test Equipment | | | |
|---|---|---|---|
| Equipment ID | Equipment Name | Last Calibration | Calibration Due Date |
| DLF107 | Integrating Sphere System | 2017/12/28 | 2018/12/27 |
| DLF108 | Auxiliary Lamp | 2017/12/28 | 2018/12/27 |
| DLF122 | Measurement Standard Lamp<br>Standard Lamp Type: 220 V, 0.4720 A, Tungsten, Omni-derectional | 2017/12/28 | 2018/12/27 |
| DLF116 | AC Power Source | 2017/12/28 | 2018/12/27 |
| DLF113 | Power Meter | 2017/12/28 | 2018/12/27 |
| DLF112 | Temperature Recorder | 2017/12/28 | 2018/12/27 |
| DLF114 | Temperature & Humidity Datalogger | 2017/12/28 | 2018/12/27 |
| DLF101 | Goniophotometer | 2017/12/28 | 2018/12/27 |
| DLF125 | Standard Lamp<br>Standard Lamp Type: 76.58 V, 6.7875 A, Tungsten, Omni-derectional | 2017/12/28 | 2018/12/27 |
| DLF104 | AC Power Source | 2017/12/28 | 2018/12/27 |
| DLF507 | DC Power Source | 2017/12/28 | 2018/12/27 |
| DLF102 | Power Meter | 2017/12/28 | 2018/12/27 |
| DLF111 | Temperature & Humidity Datalogger | 2017/12/28 | 2018/12/27 |
| DLF119 | Power Meter | 2017/12/28 | 2018/12/27 |
| DLF031 | Temperature data logger | 2017/12/28 | 2018/12/27 |
| DLF022 | Digital power meter | 2017/12/28 | 2018/12/27 |
| DLF003 | Temperature & Humidity Datalogger | 2017/12/28 | 2018/12/27 |

********** End of Test Report**********