

Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
Peachtree City, GA 30269



Scaled data based on original data using  
LM-79-08 Approved Method: Electrical and Photometric Measurements of Solid-State  
Lighting Products

Test Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

Brand: METALUX

Report Number: P827163

Luminaire Tested: **OHBL-30HE-A-UNV-L840-CD-UPL15**

Issue Date: 5/3/2024



**Test Information**

Test Method: LM-79-08  
Report Number: P827163  
REPORT IS A COMBINATION OF REPORTS P826119 AND G3-2310-221-10  
Test Lab: INNOVATION CENTER  
Issue Date: 5/3/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: METALUX  
Catalog Number: OHBL-30HE-A-UNV-L840-CD-UPL15  
Description: 30000 LUMEN OHBL HE LED LUMINAIRE WITH 80CRI, 4000K LEDS AND AISLE  
LENSAND 1500 LUMEN UPLIGHT MODULE  
Light Source: -  
Ballast/Driver: -

**Summary**

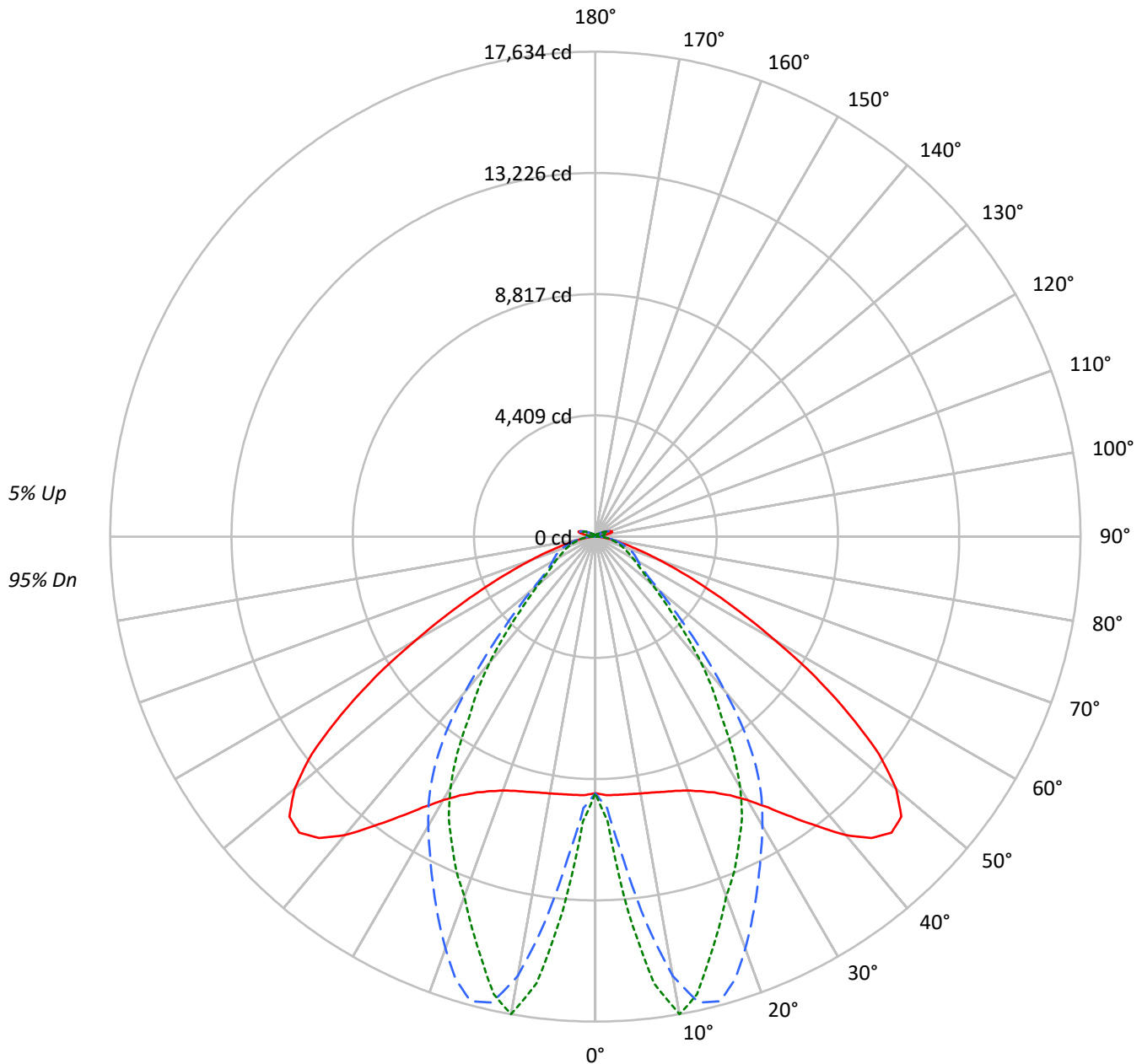
Lumens per Lamp: N/A  
Luminaire Lumens: 31463.2 lumens  
Efficiency: N/A  
Efficacy: 180.7 lumens/watt  
Spacing Criteria (0/90/45): 2.18 / 1.37 / 1.3  
Luminous Opening: Rectangular w/ Sides (W: 3.78' x L: 1.8' x H: 0.17')  
CIE Type: Direct

Input Watts (W): 174.1  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 25 FT

TEST NUMBER: P827163

CATALOG NUMBER: OHBL-30HE-A-UNV-L840-CD-UPL15

### Luminous Intensity Polar Plot





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**COEFFICIENT OF UTILIZATION - ZONAL CAVITY METHOD:**

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|
| RF  | 20  |     |     |     | 20  |     |     |     |     | 20  |     |     |     |     | 20 |    |    |    |    | 20 |
| RC  | 80  |     |     |     | 70  |     |     |     |     | 50  |     |     |     |     | 30 |    |    |    |    | 10 |
| RW  | 70  | 50  | 30  | 10  | 70  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50 | 30 | 10 | 50 | 30 | 10 |
| RCR |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |
| 0   | 118 | 118 | 118 | 118 | 115 | 115 | 115 | 115 | 108 | 108 | 108 | 103 | 103 | 103 | 98 | 98 | 98 | 95 |    |    |
| 1   | 109 | 105 | 102 | 99  | 106 | 103 | 100 | 97  | 98  | 95  | 93  | 93  | 91  | 89  | 89 | 87 | 86 | 83 |    |    |
| 2   | 101 | 94  | 88  | 84  | 98  | 92  | 87  | 82  | 88  | 83  | 80  | 84  | 80  | 77  | 80 | 77 | 75 | 73 |    |    |
| 3   | 94  | 85  | 78  | 72  | 91  | 83  | 76  | 71  | 79  | 74  | 69  | 76  | 71  | 68  | 73 | 69 | 66 | 64 |    |    |
| 4   | 87  | 76  | 69  | 63  | 84  | 75  | 68  | 62  | 72  | 66  | 61  | 69  | 64  | 60  | 66 | 62 | 58 | 56 |    |    |
| 5   | 81  | 69  | 61  | 56  | 78  | 68  | 61  | 55  | 65  | 59  | 54  | 63  | 57  | 53  | 61 | 56 | 52 | 50 |    |    |
| 6   | 75  | 63  | 55  | 49  | 73  | 62  | 54  | 49  | 60  | 53  | 48  | 58  | 52  | 48  | 56 | 51 | 47 | 45 |    |    |
| 7   | 70  | 58  | 50  | 44  | 68  | 57  | 49  | 44  | 55  | 48  | 43  | 53  | 47  | 43  | 51 | 46 | 42 | 40 |    |    |
| 8   | 65  | 53  | 45  | 40  | 64  | 52  | 45  | 40  | 51  | 44  | 39  | 49  | 43  | 39  | 48 | 42 | 38 | 37 |    |    |
| 9   | 61  | 49  | 42  | 37  | 60  | 48  | 41  | 36  | 47  | 40  | 36  | 46  | 40  | 36  | 44 | 39 | 35 | 33 |    |    |
| 10  | 58  | 46  | 38  | 33  | 56  | 45  | 38  | 33  | 44  | 37  | 33  | 42  | 37  | 33  | 41 | 36 | 32 | 31 |    |    |

**AVERAGE LUMINANCE (cd/sqm):**

|     | 0°    | 45°   | 90°   |
|-----|-------|-------|-------|
| 0°  | 14757 | 14757 | 14757 |
| 5°  | 14842 | 18569 | 21633 |
| 10° | 14984 | 25612 | 28099 |
| 15° | 15351 | 27914 | 25790 |
| 20° | 15996 | 25912 | 23048 |
| 25° | 17175 | 23315 | 21082 |
| 30° | 19166 | 21005 | 18747 |
| 35° | 22549 | 18395 | 14938 |
| 40° | 27138 | 14018 | 11889 |
| 45° | 31160 | 9557  | 8462  |
| 50° | 31627 | 6561  | 6258  |
| 55° | 27414 | 5168  | 5113  |
| 60° | 20512 | 4842  | 4600  |
| 65° | 14090 | 4864  | 4357  |
| 70° | 9036  | 4702  | 4220  |
| 75° | 5456  | 4365  | 4038  |
| 80° | 3233  | 3853  | 4166  |
| 85° | 1577  | 3339  | 3862  |



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**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 1218.2  | 3.9       |
| 10°-20°   | 4299.7  | 13.7      |
| 20°-30°   | 6335.8  | 20.1      |
| 30°-40°   | 6657.9  | 21.2      |
| 40°-50°   | 5094.6  | 16.2      |
| 50°-60°   | 3076.3  | 9.8       |
| 60°-70°   | 1877.2  | 6.0       |
| 70°-80°   | 1024.6  | 3.3       |
| 80°-90°   | 363.5   | 1.2       |
| 90°-100°  | 145.6   | 0.5       |
| 100°-110° | 504.6   | 1.6       |
| 110°-120° | 433.6   | 1.4       |
| 120°-130° | 208.1   | 0.7       |
| 130°-140° | 104.0   | 0.3       |
| 140°-150° | 60.4    | 0.2       |
| 150°-160° | 35.2    | 0.1       |
| 160°-170° | 18.3    | 0.1       |
| 170°-180° | 5.6     | 0.0       |
| 0°-30°    | 11853.7 | 37.7      |
| 0°-40°    | 18511.6 | 58.8      |
| 0°-60°    | 26682.5 | 84.8      |
| 0°-90°    | 29947.8 | 95.2      |
| 90°-120°  | 1083.8  | 3.4       |
| 90°-150°  | 1456.3  | 4.6       |
| 90°-180°  | 1515.0  | 4.8       |
| 0°-180°   | 31463.2 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°    | 22.5° | 45°   | 67.5° | 90°   | Flux  |
|------|-------|-------|-------|-------|-------|-------|
| 0°   | 9331  | 9331  | 9331  | 9331  | 9331  |       |
| 5°   | 9425  | 10112 | 11796 | 13171 | 13679 | 901   |
| 15°  | 9609  | 14966 | 17491 | 16322 | 15938 | 2732  |
| 25°  | 10268 | 17369 | 13964 | 12642 | 12330 | 4799  |
| 35°  | 12437 | 13909 | 10173 | 8472  | 7976  | 7890  |
| 45°  | 15223 | 7937  | 4686  | 4124  | 3950  | 11502 |
| 55°  | 11258 | 2691  | 2133  | 1977  | 1971  | 9948  |
| 65°  | 4513  | 1704  | 1569  | 1343  | 1274  | 4624  |
| 75°  | 1202  | 1060  | 972   | 802   | 770   | 1383  |
| 85°  | 179   | 328   | 387   | 353   | 320   | 221   |
| 90°  | 3     | 22    | 29    | 38    | 43    | 12    |
| 95°  | 28    | 72    | 107   | 142   | 165   | 100   |
| 105° | 633   | 624   | 532   | 376   | 345   | 599   |
| 115° | 436   | 436   | 440   | 438   | 429   | 440   |
| 125° | 211   | 223   | 229   | 227   | 226   | 199   |
| 135° | 125   | 129   | 132   | 134   | 135   | 99    |
| 145° | 91    | 93    | 95    | 97    | 97    | 58    |
| 155° | 73    | 74    | 76    | 76    | 77    | 34    |
| 165° | 63    | 63    | 64    | 64    | 64    | 18    |
| 175° | 57    | 57    | 57    | 58    | 58    | 6     |
| 180° | 57    | 57    | 57    | 57    | 57    |       |



TEST NUMBER: P827163

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**CANDELA DISTRIBUTION (FULL):**

|        | 0°      | 22.5°   | 45°     | 67.5°   | 90°     |
|--------|---------|---------|---------|---------|---------|
| 0°     | 9331.4  | 9331.4  | 9331.4  | 9331.4  | 9331.4  |
| 2.5°   | 9407.8  | 9503.8  | 9882.4  | 10275.3 | 10370.9 |
| 5°     | 9425.0  | 10111.6 | 11795.9 | 13171.1 | 13679.3 |
| 7.5°   | 9445.0  | 11096.4 | 14166.7 | 15850.5 | 16389.5 |
| 10°    | 9483.0  | 12341.6 | 16221.0 | 17429.9 | 17633.6 |
| 12.5°  | 9530.2  | 13660.9 | 17351.5 | 17307.4 | 17050.5 |
| 15°    | 9608.7  | 14965.8 | 17490.7 | 16321.5 | 15937.7 |
| 17.5°  | 9691.1  | 16069.8 | 16883.3 | 15248.3 | 14914.2 |
| 20°    | 9825.1  | 16889.3 | 15938.5 | 14294.4 | 13914.6 |
| 22.5°  | 10018.4 | 17339.9 | 14947.8 | 13431.6 | 13184.0 |
| 25°    | 10267.7 | 17369.1 | 13963.8 | 12642.2 | 12330.0 |
| 27.5°  | 10601.8 | 16966.1 | 13020.7 | 11868.7 | 11539.0 |
| 30°    | 11056.4 | 16194.6 | 12144.4 | 10935.9 | 10527.0 |
| 32.5°  | 11673.8 | 15084.2 | 11240.9 | 9809.9  | 9351.4  |
| 35°    | 12437.3 | 13909.4 | 10172.9 | 8471.9  | 7976.5  |
| 37.5°  | 13270.4 | 12604.9 | 8876.8  | 7287.0  | 6998.5  |
| 40°    | 14166.7 | 11260.9 | 7340.6  | 6178.2  | 5971.8  |
| 42.5°  | 14866.2 | 9799.5  | 5913.7  | 5134.3  | 4914.6  |
| 45°    | 15222.7 | 7936.9  | 4686.1  | 4123.5  | 3950.2  |
| 47.5°  | 15083.8 | 6161.0  | 3714.9  | 3276.4  | 3224.4  |
| 50°    | 14273.5 | 4549.2  | 2973.9  | 2699.0  | 2677.4  |
| 52.5°  | 13006.7 | 3390.8  | 2456.5  | 2286.4  | 2249.2  |
| 55°    | 11257.7 | 2691.4  | 2133.2  | 1977.1  | 1971.1  |
| 57.5°  | 9451.8  | 2286.4  | 1936.3  | 1815.5  | 1773.4  |
| 60°    | 7525.5  | 2038.7  | 1787.0  | 1650.6  | 1565.4  |
| 62.5°  | 5898.9  | 1865.5  | 1677.4  | 1492.1  | 1412.5  |
| 65°    | 4513.2  | 1703.8  | 1569.4  | 1342.9  | 1274.5  |
| 67.5°  | 3364.4  | 1549.8  | 1437.3  | 1186.0  | 1146.0  |
| 70°    | 2451.3  | 1391.7  | 1286.9  | 1054.8  | 1023.2  |
| 72.5°  | 1747.0  | 1234.0  | 1136.4  | 931.5   | 896.7   |
| 75°    | 1201.6  | 1059.6  | 972.0   | 801.9   | 769.5   |
| 77.5°  | 810.7   | 881.5   | 809.9   | 684.6   | 671.0   |
| 80°    | 541.4   | 699.1   | 655.0   | 580.2   | 571.8   |
| 82.5°  | 328.5   | 507.4   | 517.0   | 471.8   | 449.0   |
| 85°    | 178.9   | 328.5   | 387.3   | 352.9   | 320.1   |
| 87.5°  | 70.0    | 182.1   | 266.9   | 239.7   | 225.7   |
| 90°    | 3.0     | 22.0    | 29.0    | 38.0    | 43.0    |
| 92.5°  | 10.0    | 28.0    | 46.0    | 64.0    | 74.0    |
| 95°    | 28.0    | 72.0    | 107.0   | 142.0   | 165.0   |
| 97.5°  | 166.0   | 187.0   | 204.0   | 235.0   | 253.0   |
| 100°   | 337.0   | 364.0   | 299.0   | 314.0   | 321.0   |
| 102.5° | 542.0   | 524.0   | 387.0   | 348.0   | 342.0   |
| 105°   | 633.0   | 624.0   | 532.0   | 376.0   | 345.0   |



TEST NUMBER: P827163

CATALOG NUMBER: OHBL-30HE-A-UNV-L840-CD-UPL15

**CANDELA DISTRIBUTION (continued):**

|        | 0°    | 22.5° | 45°   | 67.5° | 90°   |
|--------|-------|-------|-------|-------|-------|
| 112.5° | 509.0 | 516.0 | 507.0 | 489.0 | 471.0 |
| 115°   | 436.0 | 436.0 | 440.0 | 438.0 | 429.0 |
| 117.5° | 374.0 | 372.0 | 376.0 | 374.0 | 372.0 |
| 120°   | 312.0 | 316.0 | 317.0 | 315.0 | 314.0 |
| 122.5° | 258.0 | 266.0 | 271.0 | 268.0 | 267.0 |
| 125°   | 211.0 | 223.0 | 229.0 | 227.0 | 226.0 |
| 127.5° | 180.0 | 187.0 | 195.0 | 195.0 | 193.0 |
| 130°   | 156.0 | 161.0 | 167.0 | 168.0 | 168.0 |
| 132.5° | 139.0 | 143.0 | 148.0 | 149.0 | 150.0 |
| 135°   | 125.0 | 129.0 | 132.0 | 134.0 | 135.0 |
| 137.5° | 115.0 | 117.0 | 121.0 | 122.0 | 123.0 |
| 140°   | 105.0 | 108.0 | 111.0 | 112.0 | 113.0 |
| 142.5° | 98.0  | 100.0 | 102.0 | 104.0 | 104.0 |
| 145°   | 91.0  | 93.0  | 95.0  | 97.0  | 97.0  |
| 147.5° | 86.0  | 88.0  | 90.0  | 90.0  | 91.0  |
| 150°   | 81.0  | 83.0  | 84.0  | 85.0  | 85.0  |
| 152.5° | 77.0  | 78.0  | 80.0  | 80.0  | 81.0  |
| 155°   | 73.0  | 74.0  | 76.0  | 76.0  | 77.0  |
| 157.5° | 70.0  | 71.0  | 72.0  | 73.0  | 73.0  |
| 160°   | 67.0  | 68.0  | 69.0  | 69.0  | 70.0  |
| 162.5° | 65.0  | 66.0  | 66.0  | 67.0  | 67.0  |
| 165°   | 63.0  | 63.0  | 64.0  | 64.0  | 64.0  |
| 167.5° | 61.0  | 61.0  | 62.0  | 62.0  | 63.0  |
| 170°   | 59.0  | 60.0  | 60.0  | 60.0  | 61.0  |
| 172.5° | 58.0  | 58.0  | 59.0  | 59.0  | 59.0  |
| 175°   | 57.0  | 57.0  | 57.0  | 58.0  | 58.0  |
| 177.5° | 56.0  | 57.0  | 57.0  | 57.0  | 57.0  |
| 180°   | 57.0  | 57.0  | 57.0  | 57.0  | 57.0  |



Report Generated By 670246072 / DESKTOP-50001EG





— 0°-180°    - - 45°-225°    - - - 90°-270°







|        |       |       |       |       |       |
|--------|-------|-------|-------|-------|-------|
| 107.5° | 633.0 | 634.0 | 587.0 | 452.0 | 379.0 |
| 110°   | 584.0 | 589.0 | 563.0 | 512.0 | 450.0 |



LM-79-2019: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

METALUX

Report Number: SP1-2304-001-1

Test Date: 05/31/2023

Luminaire Tested: OHB-15SE-N-UNV-L840

Data in this report applies to families of products including OHB-15SE-N-UNV-L840.

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2304-001-1  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 05/31/2023  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: METALUX  
 Catalog Number: **OHB-15SE-N-UNV-L840**  
 Description: 15SE OHB WITH APT LEDS, NARROW LENS, 80CRI 4000K

### Spectral Parameters

|                           |        |           |      |      |      |
|---------------------------|--------|-----------|------|------|------|
| CCT (K):                  | 4018   | CRI (Ra): | 84.0 |      |      |
| CIE u':                   | 0.2242 | R1:       | 82.5 | R9:  | 11.5 |
| CIE v':                   | 0.5025 | R2:       | 91.6 | R10: | 79.8 |
| Duv:                      | 0.0010 | R3:       | 96.1 | R11: | 80.5 |
| CIE x:                    | 0.3803 | R4:       | 81.4 | R12: | 64.0 |
| CIE y:                    | 0.3788 | R5:       | 82.4 | R13: | 85.1 |
| CIE z:                    | 0.2410 | R6:       | 88.0 | R14: | 98.4 |
| Peak Wavelength (nm):     | 454    | R7:       | 85.5 |      |      |
| Dominant Wavelength (nm): | 578    | R8:       | 64.7 |      |      |
| Purity:                   | 27.9   |           |      |      |      |
| Rf:                       | 84.5   |           |      |      |      |
| Rg:                       | 93.7   |           |      |      |      |



### Test Conditions

Stabilization Time: 23M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.7/44%  
 Sphere Temperature (°C): 25.3

REPORT NUMBER: SP1-2304-001-1

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | 76INCH SPHERE IN0058  | 2/9/2023         | 8/9/2023             |
| Power Meter                    | XITRON 2801 IN0071    | 11/29/2022       | 11/29/2023           |
| AC Power Source                | CHROMA 61603 IN0063   | 11/28/2022       | 11/28/2023           |
| DC Power Source                | AGILENT E3634A IN0208 | 11/28/2022       | 11/28/2023           |
| Sphere Thermometer             | ONSET IN0085          | 11/28/2022       | 11/28/2023           |
| Room Thermometer               | ONSET IN0046          | 11/28/2022       | 11/28/2023           |

REPORT NUMBER: SP1-2304-001-1

CIE 1931 Chromaticity Diagram



CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



Point lies inside the ANSI 4000K 4-step quadrangle

REPORT NUMBER: SP1-2304-001-1

**Photopic Flux vs. Wavelength**



#####

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 6853             | NR               | 490       | 98921            | NR               | 620       | 217813           | NR               | 750       | 11077            | NR               | 880       | 7212             | NR               |
| 365       | 5941             | NR               | 495       | 111249           | NR               | 625       | 204757           | NR               | 755       | 10374            | NR               | 885       | 8336             | NR               |
| 370       | 6345             | NR               | 500       | 125186           | NR               | 630       | 189812           | NR               | 760       | 9527             | NR               | 890       | 8299             | NR               |
| 375       | 7044             | NR               | 505       | 139782           | NR               | 635       | 174714           | NR               | 765       | 9227             | NR               | 895       | 8295             | NR               |
| 380       | 6587             | NR               | 510       | 150374           | NR               | 640       | 160641           | NR               | 770       | 8071             | NR               | 900       | 5725             | NR               |
| 385       | 6443             | NR               | 515       | 158837           | NR               | 645       | 146146           | NR               | 775       | 7303             | NR               | 905       | 5085             | NR               |
| 390       | 5977             | NR               | 520       | 167163           | NR               | 650       | 132087           | NR               | 780       | 6839             | NR               | 910       | 6133             | NR               |
| 395       | 5473             | NR               | 525       | 171514           | NR               | 655       | 118817           | NR               | 785       | 5988             | NR               | 915       | 6429             | NR               |
| 400       | 4874             | NR               | 530       | 176783           | NR               | 660       | 105411           | NR               | 790       | 5761             | NR               | 920       | 7354             | NR               |
| 405       | 4470             | NR               | 535       | 182412           | NR               | 665       | 92911            | NR               | 795       | 6396             | NR               | 925       | 6889             | NR               |
| 410       | 5232             | NR               | 540       | 187578           | NR               | 670       | 81240            | NR               | 800       | 6049             | NR               | 930       | 7465             | NR               |
| 415       | 7030             | NR               | 545       | 192635           | NR               | 675       | 70762            | NR               | 805       | 5748             | NR               | 935       | 9430             | NR               |
| 420       | 11074            | NR               | 550       | 198282           | NR               | 680       | 61913            | NR               | 810       | 5571             | NR               | 940       | 6867             | NR               |
| 425       | 19121            | NR               | 555       | 206255           | NR               | 685       | 53742            | NR               | 815       | 5977             | NR               | 945       | 7026             | NR               |
| 430       | 32148            | NR               | 560       | 213621           | NR               | 690       | 46348            | NR               | 820       | 6580             | NR               | 950       | 9476             | NR               |
| 435       | 54073            | NR               | 565       | 222021           | NR               | 695       | 40313            | NR               | 825       | 6610             | NR               | 955       | 8237             | NR               |
| 440       | 89242            | NR               | 570       | 230974           | NR               | 700       | 35240            | NR               | 830       | 6652             | NR               | 960       | 7127             | NR               |
| 445       | 153497           | NR               | 575       | 237268           | NR               | 705       | 30635            | NR               | 835       | 5919             | NR               | 965       | 5614             | NR               |
| 450       | 236793           | NR               | 580       | 244317           | NR               | 710       | 27359            | NR               | 840       | 5707             | NR               | 970       | 9396             | NR               |
| 455       | 259282           | NR               | 585       | 250340           | NR               | 715       | 24401            | NR               | 845       | 5548             | NR               | 975       | 9700             | NR               |
| 460       | 209272           | NR               | 590       | 252316           | NR               | 720       | 21810            | NR               | 850       | 5560             | NR               | 980       | 8916             | NR               |
| 465       | 162456           | NR               | 595       | 253019           | NR               | 725       | 19005            | NR               | 855       | 6972             | NR               | 985       | 9548             | NR               |
| 470       | 132627           | NR               | 600       | 252244           | NR               | 730       | 17009            | NR               | 860       | 8311             | NR               | 990       | 10271            | NR               |
| 475       | 106283           | NR               | 605       | 246798           | NR               | 735       | 14940            | NR               | 865       | 6330             | NR               | 995       | 7323             | NR               |
| 480       | 91347            | NR               | 610       | 238764           | NR               | 740       | 13159            | NR               | 870       | 8019             | NR               | 1000      | 8719             | NR               |
| 485       | 91575            | NR               | 615       | 229100           | NR               | 745       | 12000            | NR               | 875       | 7419             | NR               |           |                  |                  |

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Scotopic Flux vs. Wavelength



Scotopic Lumens: 25258.1

S/P: 1.73

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 6853             | NR               | 490       | 98921            | NR               | 620       | 217813           | NR               | 750       | 11077            | NR               | 880       | 7212             | NR               |
| 365       | 5941             | NR               | 495       | 111249           | NR               | 625       | 204757           | NR               | 755       | 10374            | NR               | 885       | 8336             | NR               |
| 370       | 6345             | NR               | 500       | 125186           | NR               | 630       | 189812           | NR               | 760       | 9527             | NR               | 890       | 8299             | NR               |
| 375       | 7044             | NR               | 505       | 139782           | NR               | 635       | 174714           | NR               | 765       | 9227             | NR               | 895       | 8295             | NR               |
| 380       | 6587             | NR               | 510       | 150374           | NR               | 640       | 160641           | NR               | 770       | 8071             | NR               | 900       | 5725             | NR               |
| 385       | 6443             | NR               | 515       | 158837           | NR               | 645       | 146146           | NR               | 775       | 7303             | NR               | 905       | 5085             | NR               |
| 390       | 5977             | NR               | 520       | 167163           | NR               | 650       | 132087           | NR               | 780       | 6839             | NR               | 910       | 6133             | NR               |
| 395       | 5473             | NR               | 525       | 171514           | NR               | 655       | 118817           | NR               | 785       | 5988             | NR               | 915       | 6429             | NR               |
| 400       | 4874             | NR               | 530       | 176783           | NR               | 660       | 105411           | NR               | 790       | 5761             | NR               | 920       | 7354             | NR               |
| 405       | 4470             | NR               | 535       | 182412           | NR               | 665       | 92911            | NR               | 795       | 6396             | NR               | 925       | 6889             | NR               |
| 410       | 5232             | NR               | 540       | 187578           | NR               | 670       | 81240            | NR               | 800       | 6049             | NR               | 930       | 7465             | NR               |
| 415       | 7030             | NR               | 545       | 192635           | NR               | 675       | 70762            | NR               | 805       | 5748             | NR               | 935       | 9430             | NR               |
| 420       | 11074            | NR               | 550       | 198282           | NR               | 680       | 61913            | NR               | 810       | 5571             | NR               | 940       | 6867             | NR               |
| 425       | 19121            | NR               | 555       | 206255           | NR               | 685       | 53742            | NR               | 815       | 5977             | NR               | 945       | 7026             | NR               |
| 430       | 32148            | NR               | 560       | 213621           | NR               | 690       | 46348            | NR               | 820       | 6580             | NR               | 950       | 9476             | NR               |
| 435       | 54073            | NR               | 565       | 222021           | NR               | 695       | 40313            | NR               | 825       | 6610             | NR               | 955       | 8237             | NR               |
| 440       | 89242            | NR               | 570       | 230974           | NR               | 700       | 35240            | NR               | 830       | 6652             | NR               | 960       | 7127             | NR               |
| 445       | 153497           | NR               | 575       | 237268           | NR               | 705       | 30635            | NR               | 835       | 5919             | NR               | 965       | 5614             | NR               |
| 450       | 236793           | NR               | 580       | 244317           | NR               | 710       | 27359            | NR               | 840       | 5707             | NR               | 970       | 9396             | NR               |
| 455       | 259282           | NR               | 585       | 250340           | NR               | 715       | 24401            | NR               | 845       | 5548             | NR               | 975       | 9700             | NR               |
| 460       | 209272           | NR               | 590       | 252316           | NR               | 720       | 21810            | NR               | 850       | 5560             | NR               | 980       | 8916             | NR               |
| 465       | 162456           | NR               | 595       | 253019           | NR               | 725       | 19005            | NR               | 855       | 6972             | NR               | 985       | 9548             | NR               |
| 470       | 132627           | NR               | 600       | 252244           | NR               | 730       | 17009            | NR               | 860       | 8311             | NR               | 990       | 10271            | NR               |
| 475       | 106283           | NR               | 605       | 246798           | NR               | 735       | 14940            | NR               | 865       | 6330             | NR               | 995       | 7323             | NR               |
| 480       | 91347            | NR               | 610       | 238764           | NR               | 740       | 13159            | NR               | 870       | 8019             | NR               | 1000      | 8719             | NR               |
| 485       | 91575            | NR               | 615       | 229100           | NR               | 745       | 12000            | NR               | 875       | 7419             | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 10357.9 M/P: 0.71**

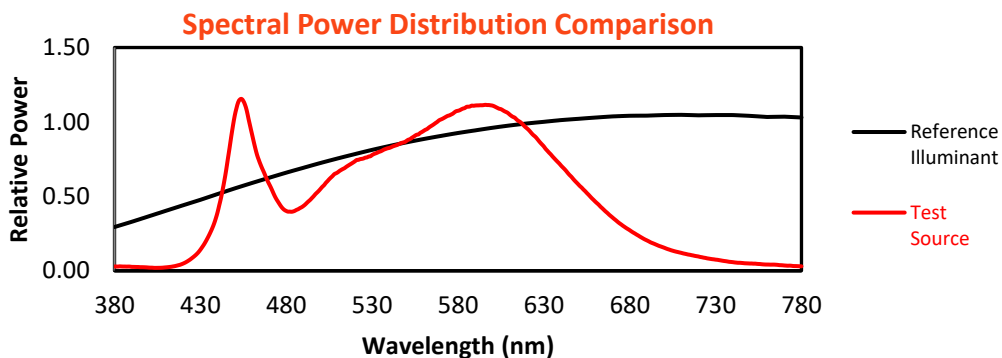
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 6853             | NR               | 490       | 98921            | NR               | 620       | 217813           | NR               | 750       | 11077            | NR               | 880       | 7212             | NR               |
| 365       | 5941             | NR               | 495       | 111249           | NR               | 625       | 204757           | NR               | 755       | 10374            | NR               | 885       | 8336             | NR               |
| 370       | 6345             | NR               | 500       | 125186           | NR               | 630       | 189812           | NR               | 760       | 9527             | NR               | 890       | 8299             | NR               |
| 375       | 7044             | NR               | 505       | 139782           | NR               | 635       | 174714           | NR               | 765       | 9227             | NR               | 895       | 8295             | NR               |
| 380       | 6587             | NR               | 510       | 150374           | NR               | 640       | 160641           | NR               | 770       | 8071             | NR               | 900       | 5725             | NR               |
| 385       | 6443             | NR               | 515       | 158837           | NR               | 645       | 146146           | NR               | 775       | 7303             | NR               | 905       | 5085             | NR               |
| 390       | 5977             | NR               | 520       | 167163           | NR               | 650       | 132087           | NR               | 780       | 6839             | NR               | 910       | 6133             | NR               |
| 395       | 5473             | NR               | 525       | 171514           | NR               | 655       | 118817           | NR               | 785       | 5988             | NR               | 915       | 6429             | NR               |
| 400       | 4874             | NR               | 530       | 176783           | NR               | 660       | 105411           | NR               | 790       | 5761             | NR               | 920       | 7354             | NR               |
| 405       | 4470             | NR               | 535       | 182412           | NR               | 665       | 92911            | NR               | 795       | 6396             | NR               | 925       | 6889             | NR               |
| 410       | 5232             | NR               | 540       | 187578           | NR               | 670       | 81240            | NR               | 800       | 6049             | NR               | 930       | 7465             | NR               |
| 415       | 7030             | NR               | 545       | 192635           | NR               | 675       | 70762            | NR               | 805       | 5748             | NR               | 935       | 9430             | NR               |
| 420       | 11074            | NR               | 550       | 198282           | NR               | 680       | 61913            | NR               | 810       | 5571             | NR               | 940       | 6867             | NR               |
| 425       | 19121            | NR               | 555       | 206255           | NR               | 685       | 53742            | NR               | 815       | 5977             | NR               | 945       | 7026             | NR               |
| 430       | 32148            | NR               | 560       | 213621           | NR               | 690       | 46348            | NR               | 820       | 6580             | NR               | 950       | 9476             | NR               |
| 435       | 54073            | NR               | 565       | 222021           | NR               | 695       | 40313            | NR               | 825       | 6610             | NR               | 955       | 8237             | NR               |
| 440       | 89242            | NR               | 570       | 230974           | NR               | 700       | 35240            | NR               | 830       | 6652             | NR               | 960       | 7127             | NR               |
| 445       | 153497           | NR               | 575       | 237268           | NR               | 705       | 30635            | NR               | 835       | 5919             | NR               | 965       | 5614             | NR               |
| 450       | 236793           | NR               | 580       | 244317           | NR               | 710       | 27359            | NR               | 840       | 5707             | NR               | 970       | 9396             | NR               |
| 455       | 259282           | NR               | 585       | 250340           | NR               | 715       | 24401            | NR               | 845       | 5548             | NR               | 975       | 9700             | NR               |
| 460       | 209272           | NR               | 590       | 252316           | NR               | 720       | 21810            | NR               | 850       | 5560             | NR               | 980       | 8916             | NR               |
| 465       | 162456           | NR               | 595       | 253019           | NR               | 725       | 19005            | NR               | 855       | 6972             | NR               | 985       | 9548             | NR               |
| 470       | 132627           | NR               | 600       | 252244           | NR               | 730       | 17009            | NR               | 860       | 8311             | NR               | 990       | 10271            | NR               |
| 475       | 106283           | NR               | 605       | 246798           | NR               | 735       | 14940            | NR               | 865       | 6330             | NR               | 995       | 7323             | NR               |
| 480       | 91347            | NR               | 610       | 238764           | NR               | 740       | 13159            | NR               | 870       | 8019             | NR               | 1000      | 8719             | NR               |
| 485       | 91575            | NR               | 615       | 229100           | NR               | 745       | 12000            | NR               | 875       | 7419             | NR               |           |                  |                  |

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**Summary**

$R_f = 84.5$   
 $R_g = 93.7$   
 CIE  $R_a = 84.0$   
 $R_9 = 11.5$



**Color Vector Graphics**



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**Individual Sample Fidelity Index ( $R_{f,i}$ )**

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 88 | CES51 = 91 | CES76 = 81 |
| CES02 = 61 | CES27 = 90 | CES52 = 93 | CES77 = 85 |
| CES03 = 31 | CES28 = 94 | CES53 = 89 | CES78 = 80 |
| CES04 = 69 | CES29 = 93 | CES54 = 88 | CES79 = 93 |
| CES05 = 48 | CES30 = 87 | CES55 = 85 | CES80 = 91 |
| CES06 = 50 | CES31 = 95 | CES56 = 84 | CES81 = 78 |
| CES07 = 41 | CES32 = 88 | CES57 = 82 | CES82 = 96 |
| CES08 = 40 | CES33 = 96 | CES58 = 82 | CES83 = 96 |
| CES09 = 29 | CES34 = 92 | CES59 = 91 | CES84 = 91 |
| CES10 = 74 | CES35 = 95 | CES60 = 88 | CES85 = 77 |
| CES11 = 57 | CES36 = 77 | CES61 = 86 | CES86 = 74 |
| CES12 = 63 | CES37 = 95 | CES62 = 78 | CES87 = 84 |
| CES13 = 42 | CES38 = 81 | CES63 = 85 | CES88 = 88 |
| CES14 = 74 | CES39 = 98 | CES64 = 77 | CES89 = 78 |
| CES15 = 71 | CES40 = 97 | CES65 = 77 | CES90 = 89 |
| CES16 = 47 | CES41 = 94 | CES66 = 74 | CES91 = 68 |
| CES17 = 49 | CES42 = 97 | CES67 = 73 | CES92 = 64 |
| CES18 = 56 | CES43 = 93 | CES68 = 79 | CES93 = 78 |
| CES19 = 71 | CES44 = 99 | CES69 = 82 | CES94 = 65 |
| CES20 = 65 | CES45 = 94 | CES70 = 77 | CES95 = 73 |
| CES21 = 86 | CES46 = 91 | CES71 = 69 | CES96 = 84 |
| CES22 = 78 | CES47 = 93 | CES72 = 90 | CES97 = 90 |
| CES23 = 91 | CES48 = 82 | CES73 = 72 | CES98 = 86 |
| CES24 = 90 | CES49 = 92 | CES74 = 90 | CES99 = 77 |
| CES25 = 71 | CES50 = 92 | CES75 = 74 |            |



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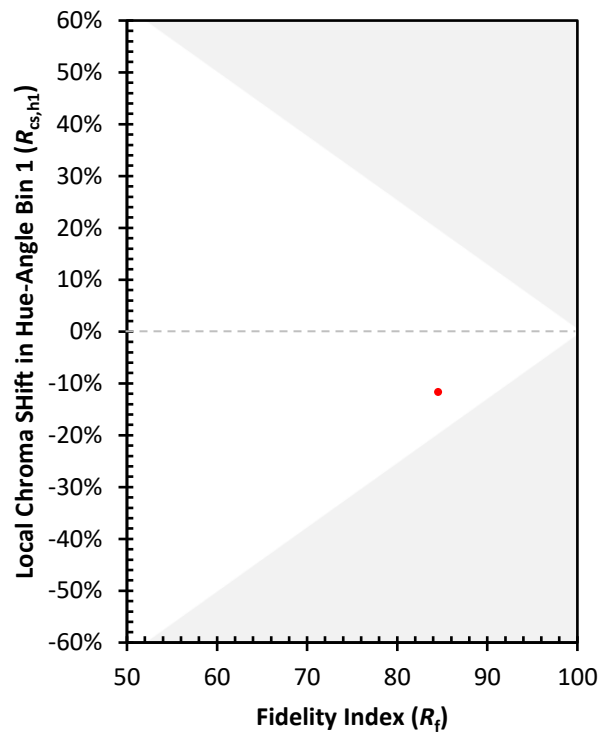
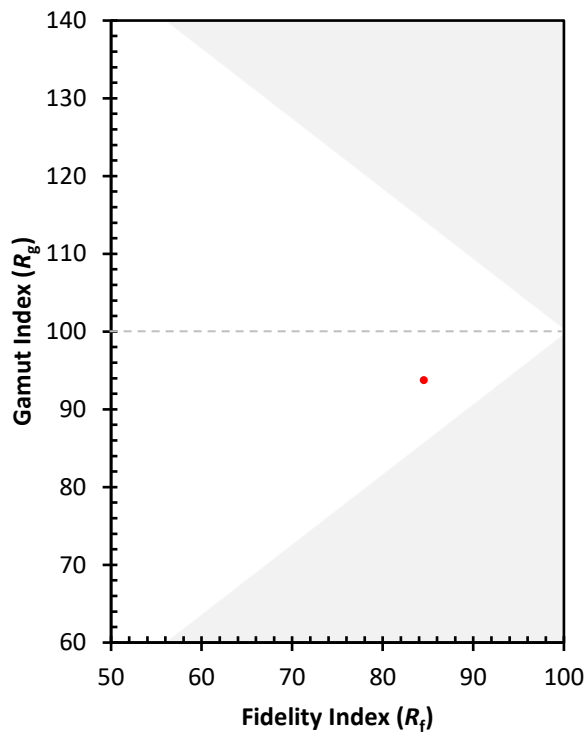
**Color Rendition by Hue-Angle Bin**



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**TM-30-18**

**Measure Comparisons**



(END OF REPORT)