

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: P827083

Luminaire Tested: **OHBL-15SE-MFL-UNV-L840-CD-UPL15**

Issue Date: 5/3/2024



**Test Information**

Test Method: LM-79-08  
Report Number: P827083  
REPORT IS A COMBINATION OF REPORTS P826115 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-15SE-MFL-UNV-L840-CD-UPL15  
Description: 15000 LUMEN OHBL SE LED LUMINAIRE WITH 80CRI, 4000K LEDS AND MEDIUM FROSTED LENS AND 1500 LUMEN UPLIGHT MODULE  
Light Source: -  
Ballast/Driver: -

**Summary**

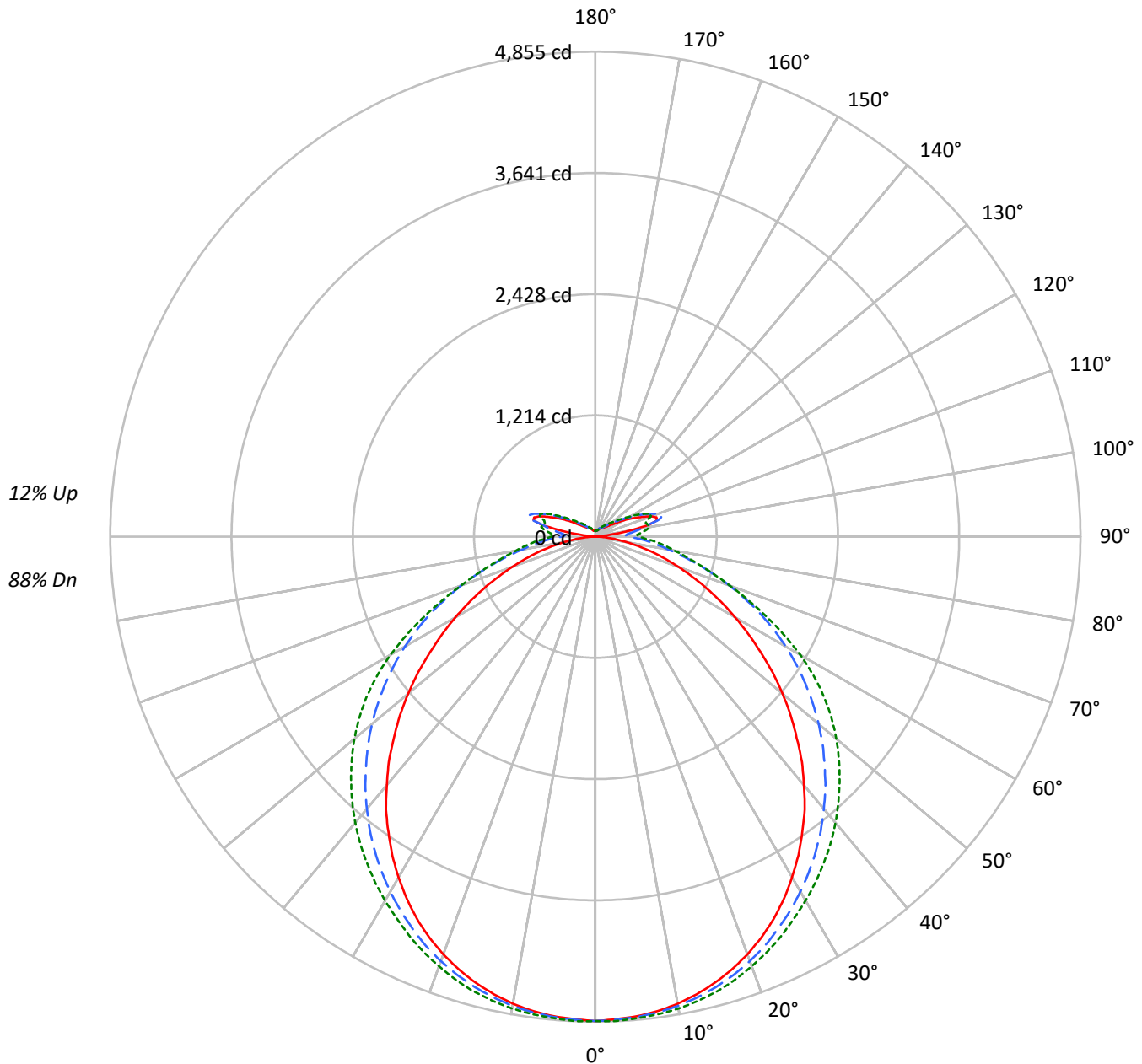
Lumens per Lamp: N/A  
Luminaire Lumens: 16034.2 lumens  
Efficiency: N/A  
Efficacy: 164.8 lumens/watt  
Spacing Criteria (0/90/45): 1.21 / 1.29 / 1.38  
Luminous Opening: Rectangular w/ Sides (W: 3.78' x L: 0.88' x H: 0.17')  
CIE Type: Semi-Direct

Input Watts (W): 97.3  
Input Voltage (V): NR  
Input Current (A<sub>in</sub>): 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: P827083

CATALOG NUMBER: OHBL-15SE-MFL-UNV-L840-CD-UPL15

### Luminous Intensity Polar Plot





TEST NUMBER: P827083

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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   | 116 | 116 | 116 | 116 | 112 | 112 | 112 | 112 | 104 | 104 | 104 | 97 | 97 | 97 | 91 | 91 | 91 | 88 |    |    |
| 1   | 105 | 100 | 96  | 92  | 101 | 97  | 93  | 89  | 90  | 87  | 84  | 84 | 82 | 80 | 79 | 77 | 75 | 72 |    |    |
| 2   | 96  | 87  | 80  | 75  | 92  | 84  | 78  | 73  | 79  | 74  | 69  | 74 | 70 | 66 | 69 | 66 | 63 | 60 |    |    |
| 3   | 87  | 77  | 68  | 62  | 84  | 74  | 67  | 61  | 69  | 63  | 58  | 65 | 60 | 55 | 61 | 57 | 53 | 50 |    |    |
| 4   | 80  | 68  | 59  | 52  | 77  | 66  | 58  | 51  | 62  | 55  | 49  | 58 | 52 | 47 | 54 | 49 | 45 | 43 |    |    |
| 5   | 73  | 61  | 52  | 45  | 70  | 59  | 50  | 44  | 55  | 48  | 43  | 52 | 46 | 41 | 49 | 44 | 39 | 37 |    |    |
| 6   | 68  | 54  | 46  | 39  | 65  | 53  | 45  | 39  | 50  | 43  | 37  | 47 | 41 | 36 | 44 | 39 | 35 | 32 |    |    |
| 7   | 63  | 49  | 41  | 35  | 60  | 48  | 40  | 34  | 45  | 38  | 33  | 43 | 36 | 32 | 40 | 35 | 31 | 29 |    |    |
| 8   | 58  | 45  | 36  | 31  | 56  | 44  | 36  | 30  | 41  | 34  | 29  | 39 | 33 | 28 | 37 | 32 | 28 | 26 |    |    |
| 9   | 54  | 41  | 33  | 28  | 52  | 40  | 32  | 27  | 38  | 31  | 26  | 36 | 30 | 26 | 34 | 29 | 25 | 23 |    |    |
| 10  | 51  | 38  | 30  | 25  | 49  | 37  | 30  | 25  | 35  | 28  | 24  | 33 | 27 | 23 | 32 | 26 | 23 | 21 |    |    |

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

|     | 0°    | 45°   | 90°   |
|-----|-------|-------|-------|
| 0°  | 15778 | 15778 | 15778 |
| 5°  | 15480 | 15536 | 15743 |
| 10° | 15178 | 15307 | 15727 |
| 15° | 14819 | 15054 | 15686 |
| 20° | 14407 | 14765 | 15595 |
| 25° | 13923 | 14427 | 15506 |
| 30° | 13329 | 14067 | 15419 |
| 35° | 12652 | 13688 | 15360 |
| 40° | 11883 | 13262 | 15312 |
| 45° | 11014 | 12802 | 15236 |
| 50° | 10085 | 12329 | 15137 |
| 55° | 9002  | 11768 | 14903 |
| 60° | 7903  | 11117 | 14315 |
| 65° | 6734  | 10312 | 13257 |
| 70° | 5499  | 9314  | 12125 |
| 75° | 4264  | 8164  | 11531 |
| 80° | 2854  | 7172  | 12079 |
| 85° | 1423  | 6792  | 15143 |



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**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 459.6   | 2.9       |
| 10°-20°   | 1318.4  | 8.2       |
| 20°-30°   | 1993.8  | 12.4      |
| 30°-40°   | 2393.6  | 14.9      |
| 40°-50°   | 2472.2  | 15.4      |
| 50°-60°   | 2224.2  | 13.9      |
| 60°-70°   | 1675.5  | 10.4      |
| 70°-80°   | 1011.7  | 6.3       |
| 80°-90°   | 498.6   | 3.1       |
| 90°-100°  | 353.9   | 2.2       |
| 100°-110° | 623.5   | 3.9       |
| 110°-120° | 503.4   | 3.1       |
| 120°-130° | 247.6   | 1.5       |
| 130°-140° | 124.8   | 0.8       |
| 140°-150° | 70.5    | 0.4       |
| 150°-160° | 39.0    | 0.2       |
| 160°-170° | 18.3    | 0.1       |
| 170°-180° | 5.6     | 0.0       |
| 0°-30°    | 3771.8  | 23.5      |
| 0°-40°    | 6165.4  | 38.5      |
| 0°-60°    | 10861.9 | 67.7      |
| 0°-90°    | 14047.8 | 87.6      |
| 90°-120°  | 1480.8  | 9.2       |
| 90°-150°  | 1923.6  | 12.0      |
| 90°-180°  | 1986.0  | 12.4      |
| 0°-180°   | 16034.2 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|------|------|-------|------|-------|------|------|
| 0°   | 4850 | 4850  | 4850 | 4850  | 4850 |      |
| 5°   | 4819 | 4832  | 4826 | 4845  | 4839 | 458  |
| 15°  | 4624 | 4647  | 4668 | 4708  | 4712 | 1304 |
| 25°  | 4223 | 4270  | 4330 | 4398  | 4408 | 1943 |
| 35°  | 3611 | 3695  | 3847 | 3963  | 3987 | 2257 |
| 45°  | 2850 | 2994  | 3244 | 3421  | 3458 | 2200 |
| 55°  | 2019 | 2228  | 2566 | 2760  | 2793 | 1810 |
| 65°  | 1232 | 1484  | 1816 | 1906  | 1885 | 1224 |
| 75°  | 580  | 833   | 1052 | 1079  | 1068 | 619  |
| 85°  | 121  | 319   | 527  | 599   | 610  | 140  |
| 90°  | 3    | 147   | 330  | 418   | 438  | 10   |
| 95°  | 34   | 156   | 332  | 429   | 463  | 105  |
| 105° | 641  | 673   | 663  | 547   | 523  | 607  |
| 115° | 446  | 463   | 521  | 546   | 542  | 450  |
| 125° | 220  | 236   | 278  | 297   | 300  | 208  |
| 135° | 133  | 140   | 157  | 177   | 182  | 106  |
| 145° | 103  | 104   | 107  | 118   | 122  | 65   |
| 155° | 85   | 87    | 88   | 87    | 89   | 38   |
| 165° | 63   | 63    | 64   | 64    | 64   | 18   |
| 175° | 57   | 57    | 57   | 58    | 58   | 6    |
| 180° | 57   | 57    | 57   | 57    | 57   |      |



TEST NUMBER: P827083

CATALOG NUMBER: OHBL-15SE-MFL-UNV-L840-CD-UPL15

**CANDELA DISTRIBUTION (FULL):**

|        | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|--------|--------|--------|--------|--------|--------|
| 0°     | 4849.9 | 4849.9 | 4849.9 | 4849.9 | 4849.9 |
| 2.5°   | 4835.7 | 4847.5 | 4840.4 | 4855.9 | 4854.7 |
| 5°     | 4819.1 | 4832.1 | 4826.2 | 4845.2 | 4839.2 |
| 7.5°   | 4790.6 | 4804.8 | 4803.6 | 4825.0 | 4822.6 |
| 10°    | 4749.0 | 4764.5 | 4769.2 | 4797.7 | 4797.7 |
| 12.5°  | 4692.1 | 4712.2 | 4724.1 | 4758.5 | 4759.7 |
| 15°    | 4624.4 | 4647.0 | 4668.3 | 4707.5 | 4712.2 |
| 17.5°  | 4542.5 | 4571.0 | 4600.7 | 4645.8 | 4651.7 |
| 20°    | 4449.9 | 4482.0 | 4522.3 | 4569.8 | 4576.9 |
| 22.5°  | 4343.1 | 4381.1 | 4433.3 | 4489.1 | 4497.4 |
| 25°    | 4223.2 | 4269.5 | 4330.0 | 4397.7 | 4408.4 |
| 27.5°  | 4086.7 | 4140.1 | 4222.0 | 4298.0 | 4307.5 |
| 30°    | 3938.3 | 4001.2 | 4103.3 | 4193.5 | 4209.0 |
| 32.5°  | 3781.7 | 3854.1 | 3979.9 | 4080.8 | 4102.1 |
| 35°    | 3610.7 | 3695.0 | 3846.9 | 3963.3 | 3987.0 |
| 37.5°  | 3442.2 | 3534.8 | 3706.9 | 3839.8 | 3868.3 |
| 40°    | 3245.2 | 3360.3 | 3557.3 | 3704.5 | 3738.9 |
| 42.5°  | 3060.0 | 3184.6 | 3407.8 | 3568.0 | 3601.2 |
| 45°    | 2849.9 | 2993.5 | 3244.0 | 3420.8 | 3457.6 |
| 47.5°  | 2652.9 | 2808.4 | 3086.1 | 3268.9 | 3306.9 |
| 50°    | 2445.1 | 2616.1 | 2917.6 | 3108.7 | 3147.8 |
| 52.5°  | 2237.4 | 2421.4 | 2743.1 | 2941.3 | 2978.1 |
| 55°    | 2019.0 | 2227.9 | 2566.2 | 2759.7 | 2792.9 |
| 57.5°  | 1816.1 | 2036.8 | 2384.6 | 2568.6 | 2588.8 |
| 60°    | 1615.5 | 1844.5 | 2199.4 | 2360.9 | 2368.0 |
| 62.5°  | 1419.6 | 1660.6 | 2009.5 | 2137.7 | 2128.2 |
| 65°    | 1232.1 | 1483.7 | 1816.1 | 1906.3 | 1884.9 |
| 67.5°  | 1051.6 | 1311.6 | 1617.8 | 1676.0 | 1647.5 |
| 70°    | 880.7  | 1144.2 | 1425.5 | 1455.2 | 1429.1 |
| 72.5°  | 730.0  | 985.2  | 1230.9 | 1255.8 | 1236.8 |
| 75°    | 580.4  | 833.2  | 1051.6 | 1078.9 | 1068.3 |
| 77.5°  | 440.4  | 686.1  | 886.7  | 922.3  | 924.6  |
| 80°    | 316.9  | 551.9  | 743.0  | 798.8  | 805.9  |
| 82.5°  | 208.9  | 428.5  | 623.2  | 694.4  | 705.1  |
| 85°    | 121.1  | 319.3  | 527.0  | 599.4  | 610.1  |
| 87.5°  | 52.2   | 230.3  | 423.7  | 489.0  | 502.1  |
| 90°    | 3.0    | 146.6  | 330.5  | 417.8  | 438.3  |
| 92.5°  | 13.6   | 131.3  | 304.8  | 394.0  | 417.0  |
| 95°    | 33.9   | 156.3  | 332.5  | 429.2  | 462.9  |
| 97.5°  | 173.1  | 258.2  | 399.8  | 485.4  | 514.1  |
| 100°   | 344.1  | 425.7  | 468.7  | 533.6  | 550.1  |
| 102.5° | 549.1  | 578.6  | 535.4  | 540.3  | 542.6  |
| 105°   | 641.3  | 672.7  | 662.6  | 546.9  | 523.0  |



TEST NUMBER: P827083

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**CANDELA DISTRIBUTION (continued):**

|        | 0°    | 22.5° | 45°   | 67.5° | 90°   |
|--------|-------|-------|-------|-------|-------|
| 112.5° | 518.5 | 548.0 | 597.2 | 610.1 | 596.8 |
| 115°   | 445.5 | 463.3 | 520.7 | 546.0 | 541.8 |
| 117.5° | 384.7 | 395.7 | 447.2 | 471.3 | 472.9 |
| 120°   | 322.7 | 336.2 | 379.9 | 401.6 | 405.4 |
| 122.5° | 268.7 | 282.6 | 326.8 | 346.3 | 348.9 |
| 125°   | 220.5 | 236.1 | 277.7 | 297.0 | 299.6 |
| 127.5° | 188.3 | 197.7 | 236.5 | 257.9 | 259.5 |
| 130°   | 164.3 | 170.5 | 202.6 | 223.8 | 227.3 |
| 132.5° | 147.3 | 153.7 | 177.7 | 197.7 | 203.4 |
| 135°   | 133.3 | 139.7 | 156.9 | 176.7 | 182.5 |
| 137.5° | 123.3 | 127.7 | 141.2 | 158.8 | 164.5 |
| 140°   | 114.5 | 118.7 | 127.6 | 142.9 | 148.6 |
| 142.5° | 108.7 | 110.7 | 115.1 | 130.1 | 133.7 |
| 145°   | 102.9 | 103.7 | 106.9 | 118.4 | 121.9 |
| 147.5° | 97.9  | 99.9  | 101.9 | 106.6 | 111.2 |
| 150°   | 92.9  | 96.1  | 95.9  | 98.1  | 101.6 |
| 152.5° | 88.9  | 91.1  | 91.9  | 90.7  | 94.1  |
| 155°   | 84.9  | 87.1  | 87.9  | 86.7  | 88.9  |
| 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° | 641.3 | 676.7 | 702.1 | 603.9 | 536.9 |
| 110°   | 592.3 | 627.0 | 665.1 | 647.3 | 591.2 |



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**

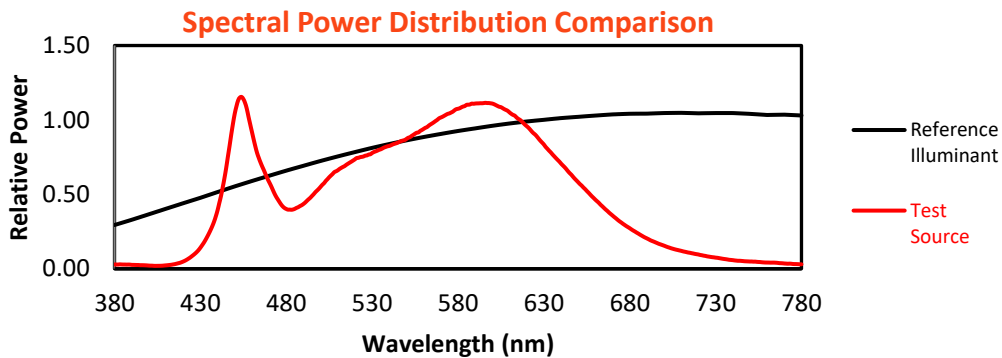
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 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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**TM-30-18**

**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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**Measure Comparisons**



(END OF REPORT)