

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: P830825

Luminaire Tested: **OHBL-90SE-MCL-UNV-L740-CD**

Issue Date: 5/3/2024



**Test Information**

Test Method: LM-79-08  
Report Number: P830825  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-2103-200-1)  
Test Lab: INNOVATION CENTER  
Issue Date: 5/3/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: METALUX  
Catalog Number: OHBL-90SE-MCL-UNV-L740-CD  
Description: 90000 LUMEN OHBL SE LED LUMINAIRE WITH 70CRI, 4000K LEDS AND MEDIUM CLEAR LENS  
Light Source: -  
Ballast/Driver: -

**Summary**

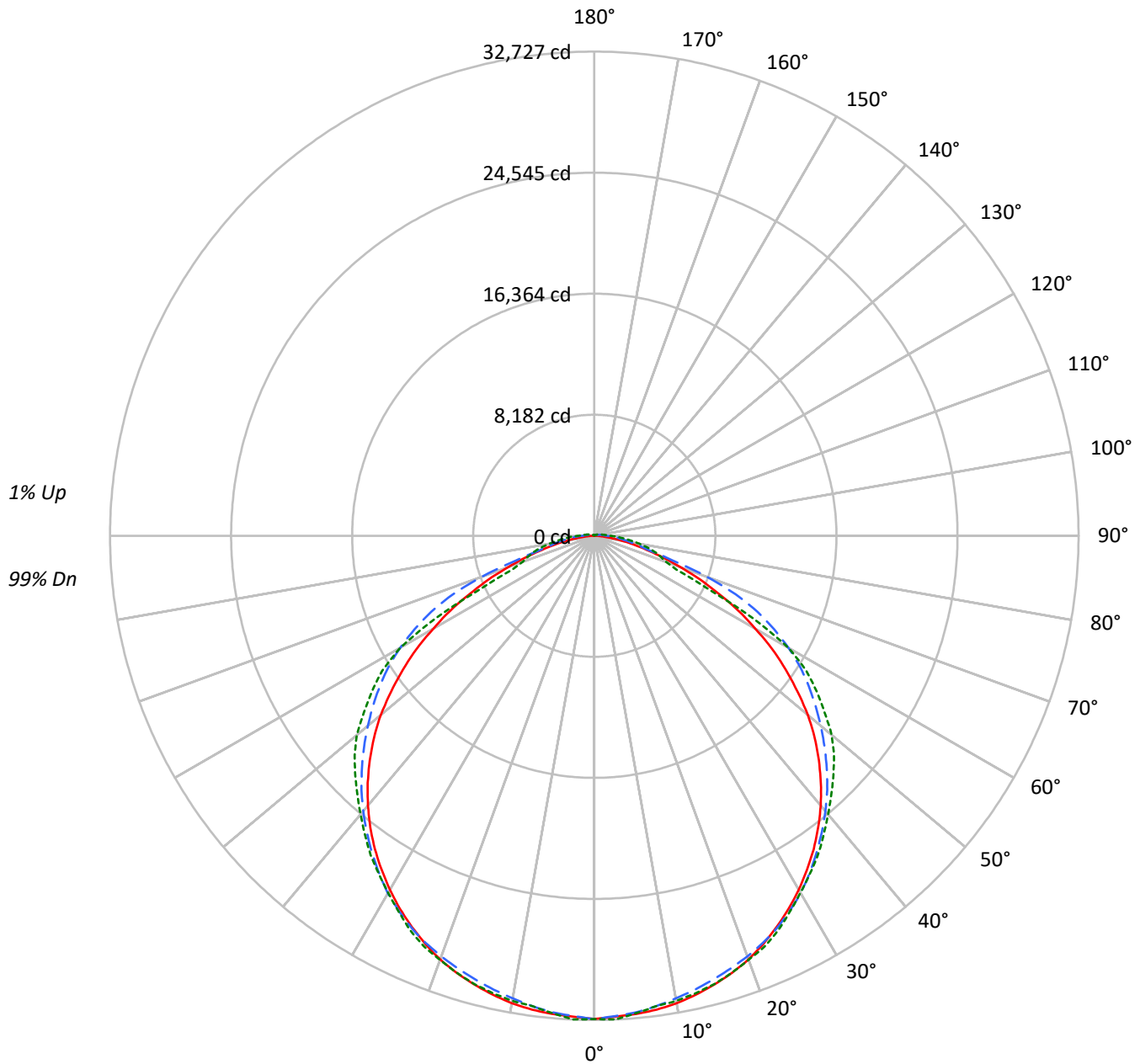
Lumens per Lamp: N/A  
Luminaire Lumens: 92315.0 lumens  
Efficiency: N/A  
Efficacy: 174.5 lumens/watt  
Spacing Criteria (0/90/45): 1.26 / 1.27 / 1.39  
Luminous Opening: Rectangular w/ Sides (W: 1.8' x L: 3.78' x H: 0.17')  
CIE Type: Direct

Input Watts (W): 529  
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: P830825

CATALOG NUMBER: OHBL-90SE-MCL-UNV-L740-CD

### Luminous Intensity Polar Plot





TEST NUMBER: P830825

CATALOG NUMBER: OHBL-90SE-MCL-UNV-L740-CD

**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  |
| RCR |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 0   | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 110 | 110 | 110 | 106 | 106 | 106 | 101 | 101 | 101 |
| 1   | 109 | 104 | 100 | 96  | 106 | 102 | 98  | 95  | 97  | 94  | 91  | 93  | 91  | 88  | 90  | 87  | 86  |
| 2   | 99  | 91  | 84  | 79  | 96  | 89  | 83  | 78  | 85  | 80  | 76  | 82  | 78  | 74  | 79  | 75  | 72  |
| 3   | 91  | 80  | 72  | 66  | 88  | 79  | 71  | 65  | 75  | 69  | 64  | 72  | 67  | 63  | 70  | 65  | 61  |
| 4   | 83  | 71  | 62  | 56  | 81  | 70  | 62  | 55  | 67  | 60  | 54  | 65  | 59  | 54  | 62  | 57  | 53  |
| 5   | 76  | 64  | 55  | 48  | 74  | 62  | 54  | 48  | 60  | 53  | 47  | 58  | 52  | 46  | 56  | 50  | 46  |
| 6   | 70  | 57  | 48  | 42  | 68  | 56  | 48  | 42  | 54  | 47  | 41  | 52  | 46  | 41  | 51  | 45  | 40  |
| 7   | 65  | 52  | 43  | 37  | 63  | 51  | 43  | 37  | 49  | 42  | 36  | 48  | 41  | 36  | 46  | 40  | 36  |
| 8   | 61  | 47  | 39  | 33  | 59  | 46  | 38  | 33  | 45  | 38  | 33  | 44  | 37  | 32  | 42  | 36  | 32  |
| 9   | 57  | 43  | 35  | 30  | 55  | 43  | 35  | 29  | 41  | 34  | 29  | 40  | 34  | 29  | 39  | 33  | 29  |
| 10  | 53  | 40  | 32  | 27  | 52  | 39  | 32  | 27  | 38  | 31  | 27  | 37  | 31  | 26  | 36  | 30  | 26  |

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

|     | 0°    | 45°   | 90°   |
|-----|-------|-------|-------|
| 0°  | 51653 | 51653 | 51653 |
| 5°  | 51315 | 50902 | 51009 |
| 10° | 51127 | 50132 | 50443 |
| 15° | 50803 | 49555 | 50105 |
| 20° | 50478 | 49192 | 49662 |
| 25° | 49869 | 48826 | 49222 |
| 30° | 49206 | 48249 | 48291 |
| 35° | 48414 | 47334 | 47777 |
| 40° | 47385 | 46389 | 47078 |
| 45° | 45958 | 45296 | 46769 |
| 50° | 44024 | 44051 | 46398 |
| 55° | 40951 | 42826 | 44666 |
| 60° | 36928 | 41034 | 41294 |
| 65° | 31678 | 37707 | 26170 |
| 70° | 25515 | 29436 | 18974 |
| 75° | 19130 | 17474 | 19257 |
| 80° | 13315 | 14529 | 18386 |
| 85° | 7578  | 13313 | 17234 |



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CATALOG NUMBER: OHBL-90SE-MCL-UNV-L740-CD

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 3079.6  | 3.3       |
| 10°-20°   | 8831.0  | 9.6       |
| 20°-30°   | 13487.7 | 14.6      |
| 30°-40°   | 16365.2 | 17.7      |
| 40°-50°   | 17152.2 | 18.6      |
| 50°-60°   | 15542.5 | 16.8      |
| 60°-70°   | 10420.6 | 11.3      |
| 70°-80°   | 4679.3  | 5.1       |
| 80°-90°   | 1698.1  | 1.8       |
| 90°-100°  | 511.1   | 0.6       |
| 100°-110° | 241.2   | 0.3       |
| 110°-120° | 120.9   | 0.1       |
| 120°-130° | 66.7    | 0.1       |
| 130°-140° | 45.8    | 0.0       |
| 140°-150° | 30.8    | 0.0       |
| 150°-160° | 22.9    | 0.0       |
| 160°-170° | 14.7    | 0.0       |
| 170°-180° | 4.7     | 0.0       |
| <hr/>     |         |           |
| 0°-30°    | 25398.3 | 27.5      |
| 0°-40°    | 41763.4 | 45.2      |
| 0°-60°    | 74458.2 | 80.7      |
| 0°-90°    | 91256.2 | 98.9      |
| 90°-120°  | 873.2   | 0.9       |
| 90°-150°  | 1016.5  | 1.1       |
| 90°-180°  | 1059.0  | 1.1       |
| 0°-180°   | 92315.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°    | 22.5° | 45°   | 67.5° | 90°   | Flux  |
|------|-------|-------|-------|-------|-------|-------|
| 0°   | 32661 | 32661 | 32661 | 32661 | 32661 |       |
| 5°   | 32449 | 32562 | 32335 | 32434 | 32392 | ###   |
| 15°  | 31396 | 31273 | 31051 | 31325 | 31362 | 8864  |
| 25°  | 29166 | 29039 | 29242 | 29511 | 29426 | 13444 |
| 35°  | 25851 | 25913 | 26177 | 26456 | 26352 | 16158 |
| 45°  | 21454 | 21804 | 22210 | 22777 | 22848 | 16527 |
| 55°  | 15788 | 16548 | 17676 | 18385 | 18342 | 14092 |
| 65°  | 9266  | 10716 | 12165 | 10267 | 8382  | 9232  |
| 75°  | 3646  | 5289  | 3891  | 3981  | 4241  | 3984  |
| 85°  | 628   | 1204  | 1544  | 1865  | 1955  | 766   |
| 90°  | 5     | 401   | 798   | 1001  | 1048  | 38    |
| 95°  | 5     | 250   | 548   | 666   | 685   | 6     |
| 105° | 19    | 109   | 269   | 326   | 340   | 22    |
| 115° | 38    | 57    | 137   | 175   | 184   | 35    |
| 125° | 33    | 38    | 85    | 99    | 104   | 33    |
| 135° | 42    | 47    | 52    | 76    | 80    | 34    |
| 145° | 42    | 47    | 47    | 52    | 57    | 28    |
| 155° | 47    | 52    | 52    | 52    | 47    | 22    |
| 165° | 52    | 52    | 52    | 52    | 52    | 15    |
| 175° | 52    | 52    | 47    | 42    | 42    | 5     |
| 180° | 47    | 47    | 47    | 47    | 47    |       |



TEST NUMBER: P830825

CATALOG NUMBER: OHBL-90SE-MCL-UNV-L740-CD

**CANDELA DISTRIBUTION (FULL):**

|        | 0°      | 22.5°   | 45°     | 67.5°   | 90°     |
|--------|---------|---------|---------|---------|---------|
| 0°     | 32661.1 | 32661.1 | 32661.1 | 32661.1 | 32661.1 |
| 2.5°   | 32528.9 | 32665.8 | 32495.8 | 32680.0 | 32727.2 |
| 5°     | 32448.6 | 32562.0 | 32335.3 | 32434.4 | 32391.9 |
| 7.5°   | 32302.2 | 32340.0 | 32070.8 | 32151.1 | 32066.1 |
| 10°    | 32085.0 | 32066.1 | 31749.7 | 31905.5 | 31924.4 |
| 12.5°  | 31763.8 | 31707.2 | 31423.8 | 31659.9 | 31664.7 |
| 15°    | 31395.5 | 31272.7 | 31050.7 | 31324.6 | 31362.4 |
| 17.5°  | 30970.5 | 30809.9 | 30663.5 | 31017.7 | 30961.0 |
| 20°    | 30474.6 | 30285.7 | 30257.3 | 30644.6 | 30502.9 |
| 22.5°  | 29860.7 | 29714.3 | 29780.4 | 30148.7 | 30059.0 |
| 25°    | 29166.4 | 29038.9 | 29242.0 | 29511.2 | 29426.2 |
| 27.5°  | 28434.4 | 28358.9 | 28590.3 | 28798.1 | 28632.8 |
| 30°    | 27631.6 | 27589.1 | 27896.1 | 28066.1 | 27858.3 |
| 32.5°  | 26757.9 | 26772.1 | 27064.9 | 27296.3 | 27102.7 |
| 35°    | 25851.2 | 25912.6 | 26177.1 | 26455.7 | 26351.8 |
| 37.5°  | 24854.8 | 24991.7 | 25256.2 | 25572.6 | 25464.0 |
| 40°    | 23801.6 | 24000.0 | 24292.8 | 24675.3 | 24576.1 |
| 42.5°  | 22663.5 | 22913.8 | 23291.6 | 23716.6 | 23707.2 |
| 45°    | 21454.5 | 21804.0 | 22210.1 | 22776.8 | 22847.7 |
| 47.5°  | 20198.3 | 20590.3 | 21105.1 | 21860.7 | 21969.3 |
| 50°    | 18833.5 | 19324.7 | 19966.9 | 20873.7 | 20939.8 |
| 52.5°  | 17312.9 | 17983.5 | 18833.5 | 19702.5 | 19622.2 |
| 55°    | 15787.5 | 16547.8 | 17676.5 | 18384.9 | 18342.4 |
| 57.5°  | 14266.8 | 15121.6 | 16491.1 | 16996.4 | 16991.7 |
| 60°    | 12566.7 | 13648.2 | 15145.2 | 15527.7 | 15149.9 |
| 62.5°  | 10994.1 | 12155.8 | 13709.5 | 13430.9 | 12136.9 |
| 65°    | 9265.6  | 10715.5 | 12165.3 | 10266.8 | 8382.5  |
| 67.5°  | 7730.8  | 9242.0  | 10332.9 | 7031.9  | 6021.2  |
| 70°    | 6186.5  | 7853.6  | 8056.7  | 5218.4  | 5147.6  |
| 72.5°  | 4817.0  | 6592.7  | 5558.4  | 4467.5  | 4694.2  |
| 75°    | 3645.8  | 5289.3  | 3891.4  | 3981.1  | 4240.8  |
| 77.5°  | 2658.8  | 4061.4  | 3027.2  | 3490.0  | 3702.5  |
| 80°    | 1827.6  | 2876.0  | 2469.9  | 2932.7  | 3079.1  |
| 82.5°  | 1147.6  | 1898.5  | 1978.7  | 2361.3  | 2512.4  |
| 85°    | 628.1   | 1204.2  | 1544.3  | 1865.4  | 1955.1  |
| 87.5°  | 259.7   | 727.3   | 1180.6  | 1440.4  | 1515.9  |
| 90°    | 4.7     | 401.4   | 798.1   | 1001.2  | 1048.4  |
| 92.5°  | 4.7     | 307.0   | 651.7   | 807.6   | 840.6   |
| 95°    | 4.7     | 250.3   | 547.8   | 665.9   | 684.8   |
| 97.5°  | 9.4     | 198.3   | 458.1   | 552.5   | 571.4   |
| 100°   | 14.2    | 165.3   | 382.5   | 462.8   | 477.0   |
| 102.5° | 18.9    | 132.2   | 321.1   | 387.2   | 401.4   |
| 105°   | 18.9    | 108.6   | 269.2   | 325.9   | 340.0   |



TEST NUMBER: P830825

CATALOG NUMBER: OHBL-90SE-MCL-UNV-L740-CD

**CANDELA DISTRIBUTION (continued):**

|        | 0°   | 22.5° | 45°   | 67.5° | 90°   |
|--------|------|-------|-------|-------|-------|
| 112.5° | 33.1 | 66.1  | 160.6 | 203.1 | 212.5 |
| 115°   | 37.8 | 56.7  | 137.0 | 174.7 | 184.2 |
| 117.5° | 37.8 | 47.2  | 118.1 | 146.4 | 155.8 |
| 120°   | 37.8 | 42.5  | 103.9 | 127.5 | 132.2 |
| 122.5° | 37.8 | 37.8  | 89.7  | 113.3 | 118.1 |
| 125°   | 33.1 | 37.8  | 85.0  | 99.2  | 103.9 |
| 127.5° | 37.8 | 37.8  | 75.6  | 89.7  | 94.5  |
| 130°   | 37.8 | 42.5  | 66.1  | 85.0  | 85.0  |
| 132.5° | 42.5 | 47.2  | 61.4  | 80.3  | 80.3  |
| 135°   | 42.5 | 47.2  | 51.9  | 75.6  | 80.3  |
| 137.5° | 47.2 | 47.2  | 47.2  | 70.8  | 75.6  |
| 140°   | 47.2 | 47.2  | 42.5  | 61.4  | 66.1  |
| 142.5° | 42.5 | 47.2  | 42.5  | 56.7  | 61.4  |
| 145°   | 42.5 | 47.2  | 47.2  | 51.9  | 56.7  |
| 147.5° | 47.2 | 47.2  | 47.2  | 47.2  | 51.9  |
| 150°   | 47.2 | 47.2  | 47.2  | 47.2  | 47.2  |
| 152.5° | 47.2 | 47.2  | 47.2  | 47.2  | 47.2  |
| 155°   | 47.2 | 51.9  | 51.9  | 51.9  | 47.2  |
| 157.5° | 47.2 | 51.9  | 51.9  | 51.9  | 51.9  |
| 160°   | 47.2 | 51.9  | 51.9  | 51.9  | 51.9  |
| 162.5° | 51.9 | 51.9  | 51.9  | 51.9  | 51.9  |
| 165°   | 51.9 | 51.9  | 51.9  | 51.9  | 51.9  |
| 167.5° | 51.9 | 56.7  | 51.9  | 51.9  | 51.9  |
| 170°   | 51.9 | 51.9  | 51.9  | 47.2  | 47.2  |
| 172.5° | 51.9 | 51.9  | 51.9  | 47.2  | 47.2  |
| 175°   | 51.9 | 51.9  | 47.2  | 42.5  | 42.5  |
| 177.5° | 56.7 | 51.9  | 47.2  | 42.5  | 37.8  |
| 180°   | 47.2 | 47.2  | 47.2  | 47.2  | 47.2  |



Report Generated By 670246072 / DESKTOP-50001EG





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







|        |      |      |       |       |       |
|--------|------|------|-------|-------|-------|
| 107.5° | 23.6 | 89.7 | 231.4 | 278.6 | 288.1 |
| 110°   | 28.3 | 75.6 | 193.6 | 236.1 | 245.6 |



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

Report Prepared for

Cooper Lighting Solutions

METALUX

Report Number: SP1-2307-100-3

Test Date: 08/03/2023

Luminaire Tested: OHB-15SE-N-UNV-L740-CD

Data in this report applies to families of products including OHB-15SE-N-UNV-L740-CD.

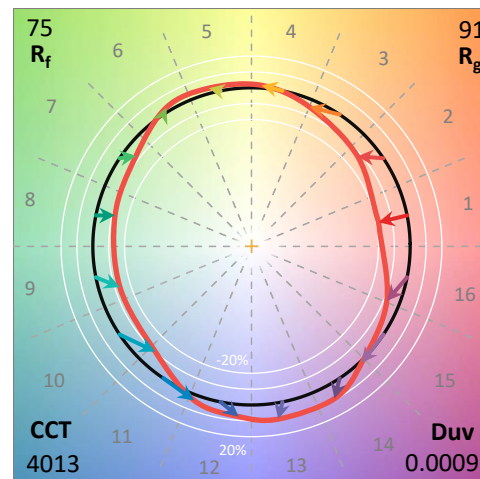
### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2307-100-3  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 08/04/2023  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: METALUX  
 Catalog Number: **OHB-15SE-N-UNV-L740-CD**  
 Description: 15000 LUMEN OHB SE LED LUMINAIRE WITH 70CRI, 4000K LEDS AND NARROW LENS

LENS

### Spectral Parameters

|                           |        |           |      |      |       |
|---------------------------|--------|-----------|------|------|-------|
| CCT (K):                  | 4013   | CRI (Ra): | 71.9 |      |       |
| CIE u':                   | 0.2243 | R1:       | 67.7 | R9:  | -37.4 |
| CIE v':                   | 0.5023 | R2:       | 81.2 | R10: | 55.0  |
| Duv:                      | 0.0009 | R3:       | 90.6 | R11: | 61.2  |
| CIE x:                    | 0.3803 | R4:       | 67.3 | R12: | 42.7  |
| CIE y:                    | 0.3785 | R5:       | 67.5 | R13: | 70.6  |
| CIE z:                    | 0.2412 | R6:       | 72.5 | R14: | 94.8  |
| Peak Wavelength (nm):     | 454    | R7:       | 80.1 |      |       |
| Dominant Wavelength (nm): | 578    | R8:       | 48.1 |      |       |
| Purity:                   | 27.9   |           |      |      |       |
| Rf:                       | 74.7   |           |      |      |       |
| Rg:                       | 90.6   |           |      |      |       |



### Test Conditions

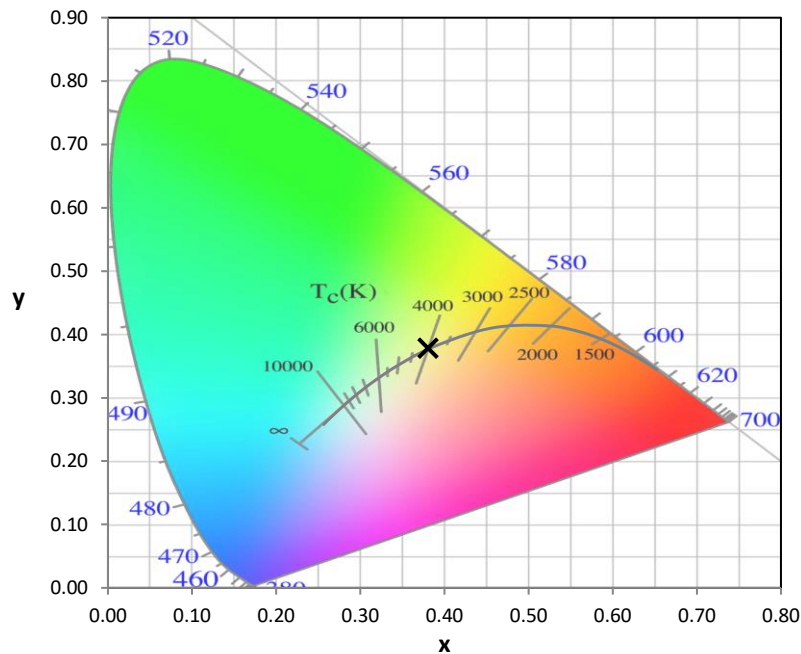
Stabilization Time: 24M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.7/58%  
 Sphere Temperature (°C): 25.2

REPORT NUMBER: SP1-2307-100-3

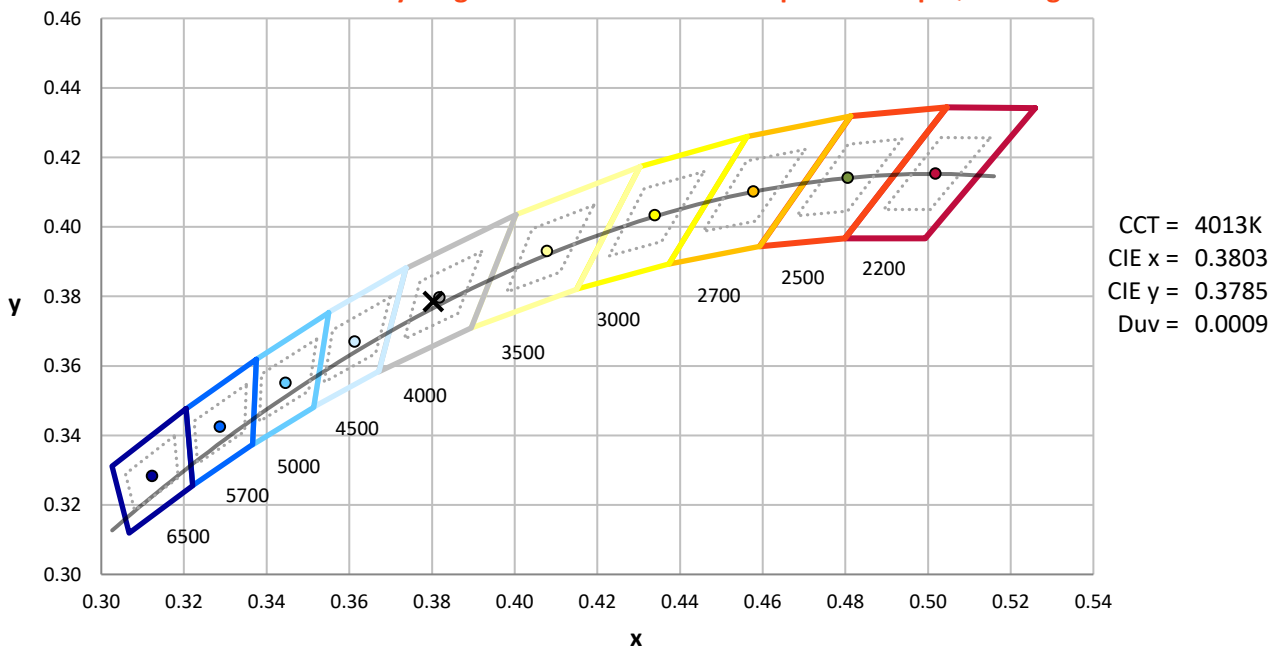
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| 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: SP1-2307-100-3

CIE 1931 Chromaticity Diagram



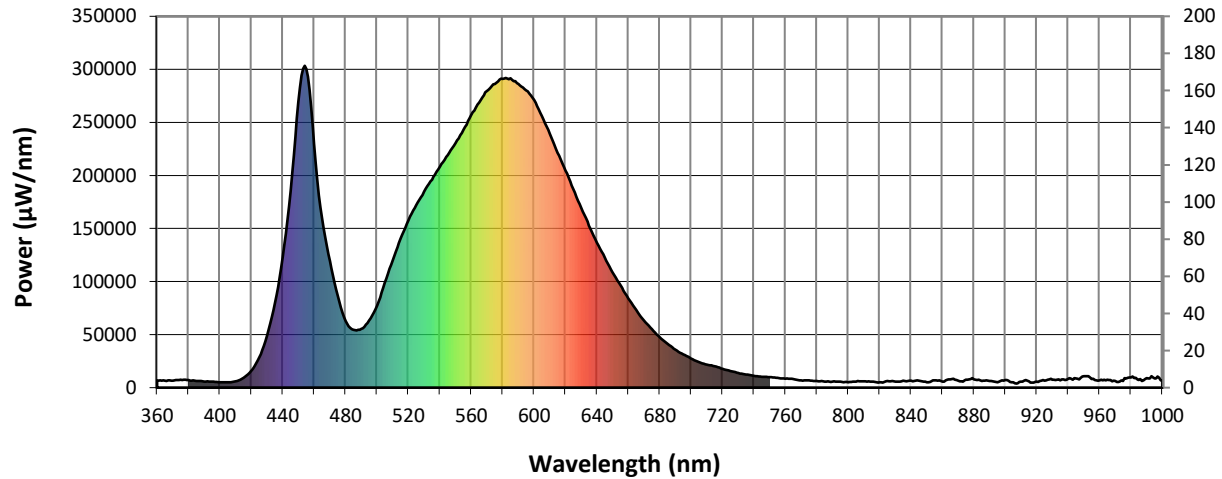
CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



Point lies inside the ANSI 4000K 4-step quadrangle

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**Photopic Flux vs. Wavelength**

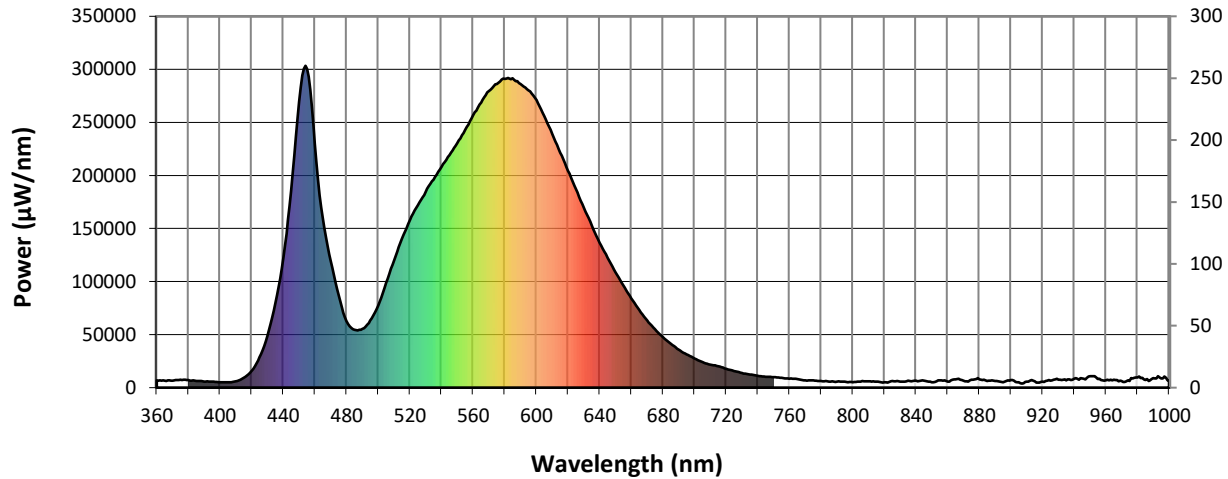


#####

| 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       | 6930             | NR               | 490       | 55345            | NR               | 620       | 204359           | NR               | 750       | 9973             | NR               | 880       | 7740             | NR               |
| 365       | 6548             | NR               | 495       | 63140            | NR               | 625       | 187136           | NR               | 755       | 9262             | NR               | 885       | 6139             | NR               |
| 370       | 6520             | NR               | 500       | 77260            | NR               | 630       | 169554           | NR               | 760       | 8423             | NR               | 890       | 6392             | NR               |
| 375       | 7463             | NR               | 505       | 98785            | NR               | 635       | 152565           | NR               | 765       | 8205             | NR               | 895       | 5061             | NR               |
| 380       | 7033             | NR               | 510       | 119863           | NR               | 640       | 136700           | NR               | 770       | 6817             | NR               | 900       | 7326             | NR               |
| 385       | 6403             | NR               | 515       | 140055           | NR               | 645       | 122449           | NR               | 775       | 6792             | NR               | 905       | 5039             | NR               |
| 390       | 5734             | NR               | 520       | 157790           | NR               | 650       | 108580           | NR               | 780       | 6216             | NR               | 910       | 5717             | NR               |
| 395       | 5717             | NR               | 525       | 171938           | NR               | 655       | 96370            | NR               | 785       | 5732             | NR               | 915       | 5977             | NR               |
| 400       | 4977             | NR               | 530       | 184920           | NR               | 660       | 84194            | NR               | 790       | 5647             | NR               | 920       | 5766             | NR               |
| 405       | 5006             | NR               | 535       | 196020           | NR               | 665       | 73166            | NR               | 795       | 5584             | NR               | 925       | 6611             | NR               |
| 410       | 5959             | NR               | 540       | 208194           | NR               | 670       | 63358            | NR               | 800       | 5174             | NR               | 930       | 7338             | NR               |
| 415       | 9179             | NR               | 545       | 219324           | NR               | 675       | 55149            | NR               | 805       | 5757             | NR               | 935       | 6930             | NR               |
| 420       | 15787            | NR               | 550       | 230377           | NR               | 680       | 47533            | NR               | 810       | 6012             | NR               | 940       | 8242             | NR               |
| 425       | 28518            | NR               | 555       | 242973           | NR               | 685       | 41350            | NR               | 815       | 5577             | NR               | 945       | 8766             | NR               |
| 430       | 48907            | NR               | 560       | 256802           | NR               | 690       | 35841            | NR               | 820       | 5086             | NR               | 950       | 10931            | NR               |
| 435       | 79961            | NR               | 565       | 268752           | NR               | 695       | 31197            | NR               | 825       | 6404             | NR               | 955       | 8190             | NR               |
| 440       | 122565           | NR               | 570       | 279406           | NR               | 700       | 27528            | NR               | 830       | 5767             | NR               | 960       | 6809             | NR               |
| 445       | 185397           | NR               | 575       | 286045           | NR               | 705       | 24001            | NR               | 835       | 6610             | NR               | 965       | 7570             | NR               |
| 450       | 269609           | NR               | 580       | 291082           | NR               | 710       | 21755            | NR               | 840       | 6428             | NR               | 970       | 6365             | NR               |
| 455       | 300483           | NR               | 585       | 291620           | NR               | 715       | 20058            | NR               | 845       | 6469             | NR               | 975       | 6203             | NR               |
| 460       | 229777           | NR               | 590       | 286117           | NR               | 720       | 17690            | NR               | 850       | 5020             | NR               | 980       | 9515             | NR               |
| 465       | 159722           | NR               | 595       | 280083           | NR               | 725       | 15738            | NR               | 855       | 6786             | NR               | 985       | 7323             | NR               |
| 470       | 119038           | NR               | 600       | 270967           | NR               | 730       | 13744            | NR               | 860       | 5776             | NR               | 990       | 9023             | NR               |
| 475       | 86663            | NR               | 605       | 255964           | NR               | 735       | 12435            | NR               | 865       | 7909             | NR               | 995       | 8813             | NR               |
| 480       | 62772            | NR               | 610       | 239107           | NR               | 740       | 11118            | NR               | 870       | 6451             | NR               | 1000      | 6436             | NR               |
| 485       | 54561            | NR               | 615       | 221194           | NR               | 745       | 10318            | NR               | 875       | 7611             | NR               |           |                  |                  |

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Scotopic Flux vs. Wavelength



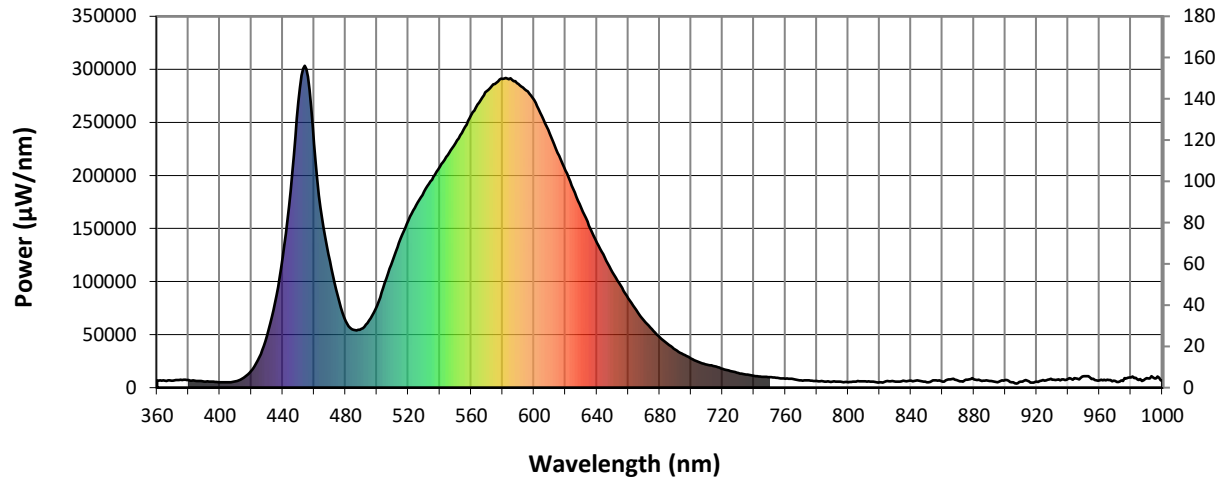
Scotopic Lumens: 24452.5

S/P: 1.56

| 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       | 6930             | NR               | 490       | 55345            | NR               | 620       | 204359           | NR               | 750       | 9973             | NR               | 880       | 7740             | NR               |
| 365       | 6548             | NR               | 495       | 63140            | NR               | 625       | 187136           | NR               | 755       | 9262             | NR               | 885       | 6139             | NR               |
| 370       | 6520             | NR               | 500       | 77260            | NR               | 630       | 169554           | NR               | 760       | 8423             | NR               | 890       | 6392             | NR               |
| 375       | 7463             | NR               | 505       | 98785            | NR               | 635       | 152565           | NR               | 765       | 8205             | NR               | 895       | 5061             | NR               |
| 380       | 7033             | NR               | 510       | 119863           | NR               | 640       | 136700           | NR               | 770       | 6817             | NR               | 900       | 7326             | NR               |
| 385       | 6403             | NR               | 515       | 140055           | NR               | 645       | 122449           | NR               | 775       | 6792             | NR               | 905       | 5039             | NR               |
| 390       | 5734             | NR               | 520       | 157790           | NR               | 650       | 108580           | NR               | 780       | 6216             | NR               | 910       | 5717             | NR               |
| 395       | 5717             | NR               | 525       | 171938           | NR               | 655       | 96370            | NR               | 785       | 5732             | NR               | 915       | 5977             | NR               |
| 400       | 4977             | NR               | 530       | 184920           | NR               | 660       | 84194            | NR               | 790       | 5647             | NR               | 920       | 5766             | NR               |
| 405       | 5006             | NR               | 535       | 196020           | NR               | 665       | 73166            | NR               | 795       | 5584             | NR               | 925       | 6611             | NR               |
| 410       | 5959             | NR               | 540       | 208194           | NR               | 670       | 63358            | NR               | 800       | 5174             | NR               | 930       | 7338             | NR               |
| 415       | 9179             | NR               | 545       | 219324           | NR               | 675       | 55149            | NR               | 805       | 5757             | NR               | 935       | 6930             | NR               |
| 420       | 15787            | NR               | 550       | 230377           | NR               | 680       | 47533            | NR               | 810       | 6012             | NR               | 940       | 8242             | NR               |
| 425       | 28518            | NR               | 555       | 242973           | NR               | 685       | 41350            | NR               | 815       | 5577             | NR               | 945       | 8766             | NR               |
| 430       | 48907            | NR               | 560       | 256802           | NR               | 690       | 35841            | NR               | 820       | 5086             | NR               | 950       | 10931            | NR               |
| 435       | 79961            | NR               | 565       | 268752           | NR               | 695       | 31197            | NR               | 825       | 6404             | NR               | 955       | 8190             | NR               |
| 440       | 122565           | NR               | 570       | 279406           | NR               | 700       | 27528            | NR               | 830       | 5767             | NR               | 960       | 6809             | NR               |
| 445       | 185397           | NR               | 575       | 286045           | NR               | 705       | 24001            | NR               | 835       | 6610             | NR               | 965       | 7570             | NR               |
| 450       | 269609           | NR               | 580       | 291082           | NR               | 710       | 21755            | NR               | 840       | 6428             | NR               | 970       | 6365             | NR               |
| 455       | 300483           | NR               | 585       | 291620           | NR               | 715       | 20058            | NR               | 845       | 6469             | NR               | 975       | 6203             | NR               |
| 460       | 229777           | NR               | 590       | 286117           | NR               | 720       | 17690            | NR               | 850       | 5020             | NR               | 980       | 9515             | NR               |
| 465       | 159722           | NR               | 595       | 280083           | NR               | 725       | 15738            | NR               | 855       | 6786             | NR               | 985       | 7323             | NR               |
| 470       | 119038           | NR               | 600       | 270967           | NR               | 730       | 13744            | NR               | 860       | 5776             | NR               | 990       | 9023             | NR               |
| 475       | 86663            | NR               | 605       | 255964           | NR               | 735       | 12435            | NR               | 865       | 7909             | NR               | 995       | 8813             | NR               |
| 480       | 62772            | NR               | 610       | 239107           | NR               | 740       | 11118            | NR               | 870       | 6451             | NR               | 1000      | 6436             | NR               |
| 485       | 54561            | NR               | 615       | 221194           | NR               | 745       | 10318            | NR               | 875       | 7611             | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 9678.5**

**M/P: 0.62**

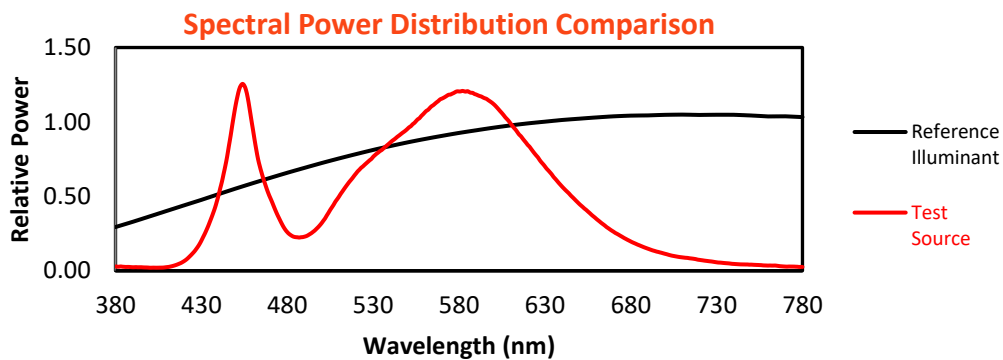
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 6930             | NR               | 490       | 55345            | NR               | 620       | 204359           | NR               | 750       | 9973             | NR               | 880       | 7740             | NR               |
| 365       | 6548             | NR               | 495       | 63140            | NR               | 625       | 187136           | NR               | 755       | 9262             | NR               | 885       | 6139             | NR               |
| 370       | 6520             | NR               | 500       | 77260            | NR               | 630       | 169554           | NR               | 760       | 8423             | NR               | 890       | 6392             | NR               |
| 375       | 7463             | NR               | 505       | 98785            | NR               | 635       | 152565           | NR               | 765       | 8205             | NR               | 895       | 5061             | NR               |
| 380       | 7033             | NR               | 510       | 119863           | NR               | 640       | 136700           | NR               | 770       | 6817             | NR               | 900       | 7326             | NR               |
| 385       | 6403             | NR               | 515       | 140055           | NR               | 645       | 122449           | NR               | 775       | 6792             | NR               | 905       | 5039             | NR               |
| 390       | 5734             | NR               | 520       | 157790           | NR               | 650       | 108580           | NR               | 780       | 6216             | NR               | 910       | 5717             | NR               |
| 395       | 5717             | NR               | 525       | 171938           | NR               | 655       | 96370            | NR               | 785       | 5732             | NR               | 915       | 5977             | NR               |
| 400       | 4977             | NR               | 530       | 184920           | NR               | 660       | 84194            | NR               | 790       | 5647             | NR               | 920       | 5766             | NR               |
| 405       | 5006             | NR               | 535       | 196020           | NR               | 665       | 73166            | NR               | 795       | 5584             | NR               | 925       | 6611             | NR               |
| 410       | 5959             | NR               | 540       | 208194           | NR               | 670       | 63358            | NR               | 800       | 5174             | NR               | 930       | 7338             | NR               |
| 415       | 9179             | NR               | 545       | 219324           | NR               | 675       | 55149            | NR               | 805       | 5757             | NR               | 935       | 6930             | NR               |
| 420       | 15787            | NR               | 550       | 230377           | NR               | 680       | 47533            | NR               | 810       | 6012             | NR               | 940       | 8242             | NR               |
| 425       | 28518            | NR               | 555       | 242973           | NR               | 685       | 41350            | NR               | 815       | 5577             | NR               | 945       | 8766             | NR               |
| 430       | 48907            | NR               | 560       | 256802           | NR               | 690       | 35841            | NR               | 820       | 5086             | NR               | 950       | 10931            | NR               |
| 435       | 79961            | NR               | 565       | 268752           | NR               | 695       | 31197            | NR               | 825       | 6404             | NR               | 955       | 8190             | NR               |
| 440       | 122565           | NR               | 570       | 279406           | NR               | 700       | 27528            | NR               | 830       | 5767             | NR               | 960       | 6809             | NR               |
| 445       | 185397           | NR               | 575       | 286045           | NR               | 705       | 24001            | NR               | 835       | 6610             | NR               | 965       | 7570             | NR               |
| 450       | 269609           | NR               | 580       | 291082           | NR               | 710       | 21755            | NR               | 840       | 6428             | NR               | 970       | 6365             | NR               |
| 455       | 300483           | NR               | 585       | 291620           | NR               | 715       | 20058            | NR               | 845       | 6469             | NR               | 975       | 6203             | NR               |
| 460       | 229777           | NR               | 590       | 286117           | NR               | 720       | 17690            | NR               | 850       | 5020             | NR               | 980       | 9515             | NR               |
| 465       | 159722           | NR               | 595       | 280083           | NR               | 725       | 15738            | NR               | 855       | 6786             | NR               | 985       | 7323             | NR               |
| 470       | 119038           | NR               | 600       | 270967           | NR               | 730       | 13744            | NR               | 860       | 5776             | NR               | 990       | 9023             | NR               |
| 475       | 86663            | NR               | 605       | 255964           | NR               | 735       | 12435            | NR               | 865       | 7909             | NR               | 995       | 8813             | NR               |
| 480       | 62772            | NR               | 610       | 239107           | NR               | 740       | 11118            | NR               | 870       | 6451             | NR               | 1000      | 6436             | NR               |
| 485       | 54561            | NR               | 615       | 221194           | NR               | 745       | 10318            | NR               | 875       | 7611             | NR               |           |                  |                  |

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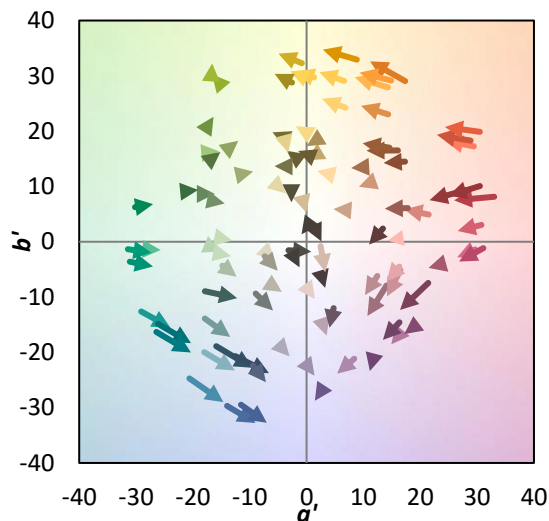
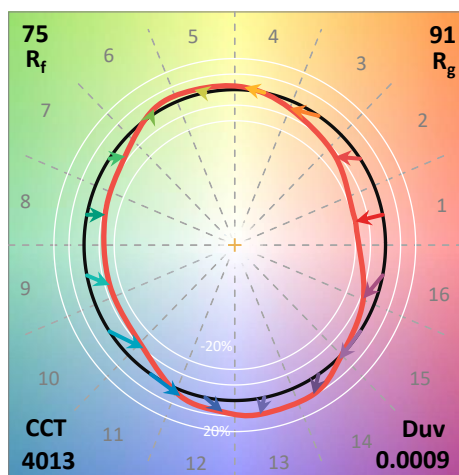
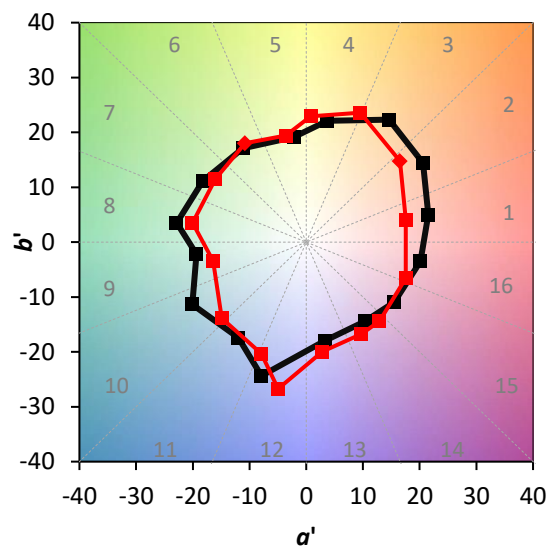
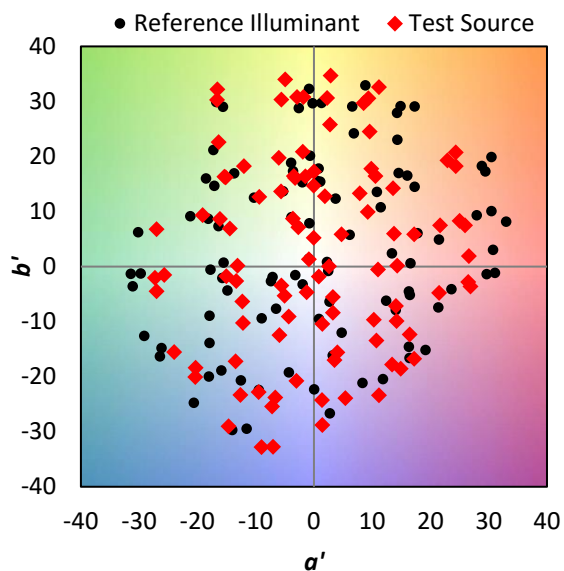
TM-30-18

### Summary

$R_f = 74.7$   
 $R_g = 90.6$   
 CIE  $R_a = 71.9$   
 $R_g = -37.4$



### Color Vector Graphics

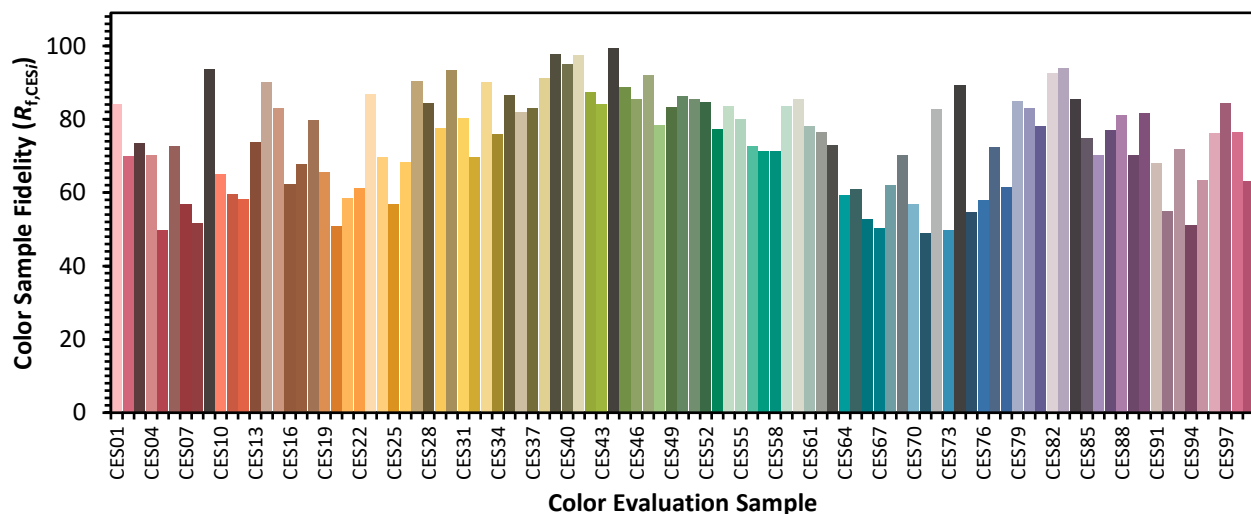


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**Individual Sample Fidelity Index ( $R_{f,i}$ )**

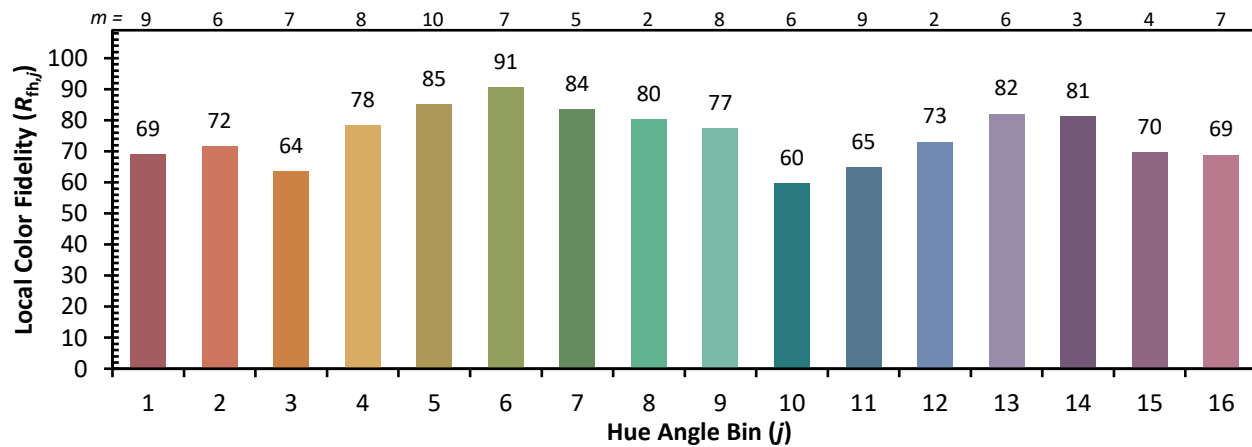
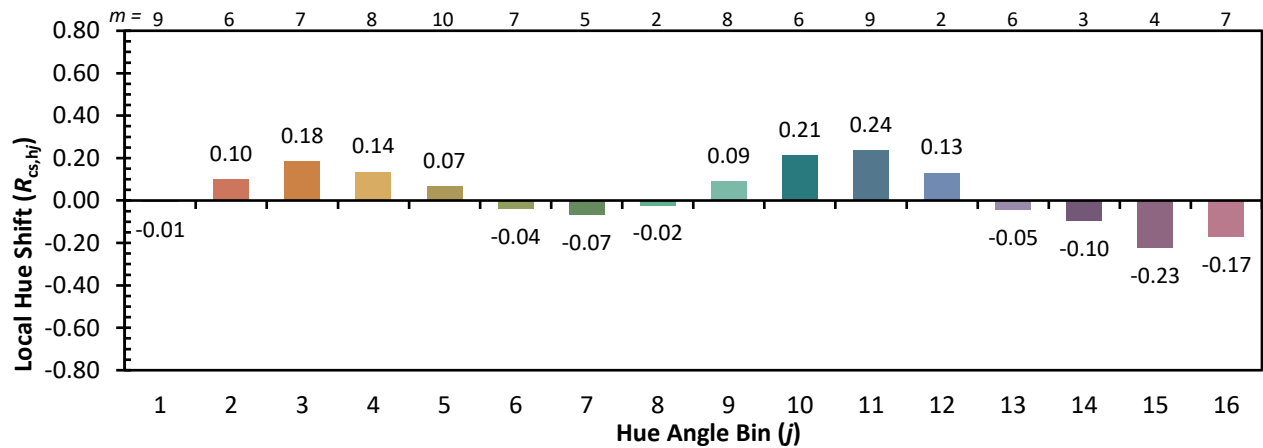
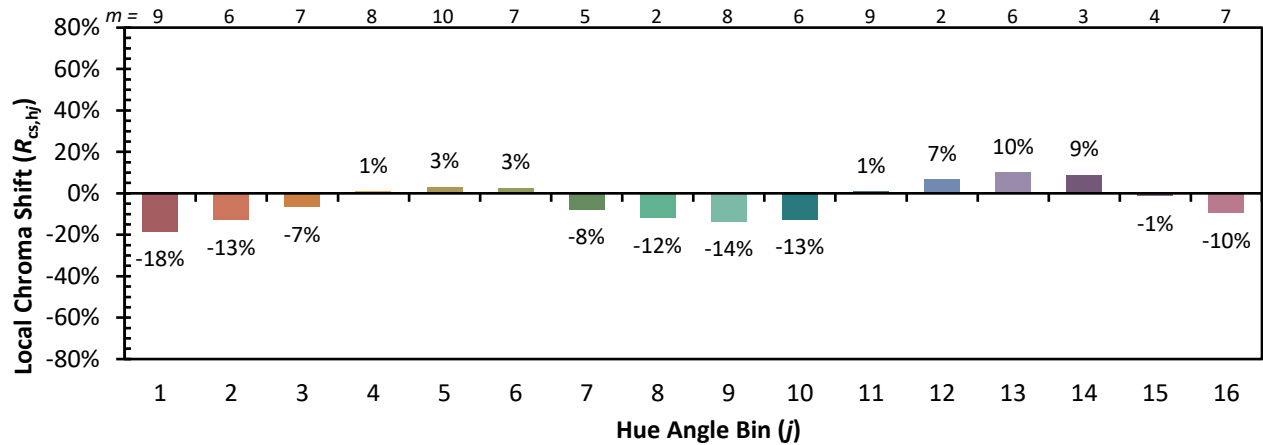
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 68 | CES51 = 85 | CES76 = 58 |
| CES02 = 61 | CES27 = 90 | CES52 = 85 | CES77 = 72 |
| CES03 = 30 | CES28 = 84 | CES53 = 77 | CES78 = 61 |
| CES04 = 70 | CES29 = 77 | CES54 = 83 | CES79 = 85 |
| CES05 = 47 | CES30 = 93 | CES55 = 80 | CES80 = 83 |
| CES06 = 50 | CES31 = 80 | CES56 = 73 | CES81 = 78 |
| CES07 = 39 | CES32 = 70 | CES57 = 71 | CES82 = 93 |
| CES08 = 39 | CES33 = 90 | CES58 = 71 | CES83 = 94 |
| CES09 = 29 | CES34 = 76 | CES59 = 84 | CES84 = 85 |
| CES10 = 74 | CES35 = 87 | CES60 = 85 | CES85 = 75 |
| CES11 = 57 | CES36 = 82 | CES61 = 78 | CES86 = 70 |
| CES12 = 63 | CES37 = 83 | CES62 = 76 | CES87 = 77 |
| CES13 = 42 | CES38 = 91 | CES63 = 73 | CES88 = 81 |
| CES14 = 74 | CES39 = 98 | CES64 = 59 | CES89 = 70 |
| CES15 = 71 | CES40 = 95 | CES65 = 61 | CES90 = 82 |
| CES16 = 46 | CES41 = 97 | CES66 = 53 | CES91 = 68 |
| CES17 = 49 | CES42 = 87 | CES67 = 50 | CES92 = 55 |
| CES18 = 56 | CES43 = 84 | CES68 = 62 | CES93 = 72 |
| CES19 = 72 | CES44 = 99 | CES69 = 70 | CES94 = 51 |
| CES20 = 64 | CES45 = 89 | CES70 = 57 | CES95 = 63 |
| CES21 = 86 | CES46 = 86 | CES71 = 49 | CES96 = 76 |
| CES22 = 78 | CES47 = 92 | CES72 = 83 | CES97 = 84 |
| CES23 = 92 | CES48 = 78 | CES73 = 50 | CES98 = 76 |
| CES24 = 91 | CES49 = 83 | CES74 = 89 | CES99 = 63 |
| CES25 = 72 | CES50 = 86 | CES75 = 55 |            |



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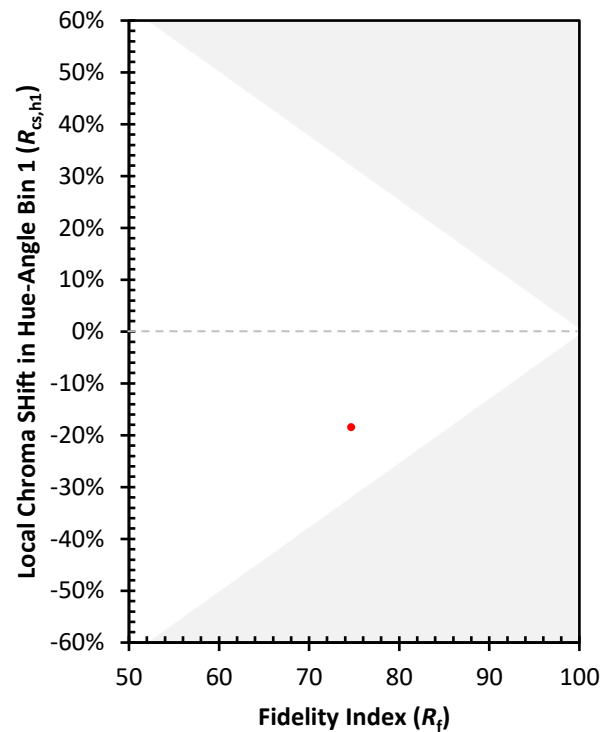
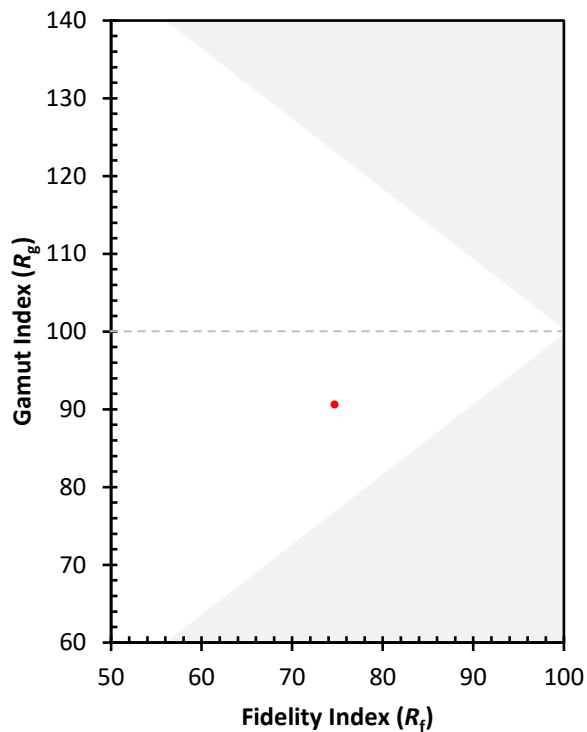
**Color Rendition by Hue-Angle Bin**



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**Measure Comparisons**



(END OF REPORT)