

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: P860197

Luminaire Tested: **SPHB-48SE-W-L740-CD**

Issue Date: 7/11/2024

This test was performed under the Supervised Manufacturer's Testing Program. The results of this test have not been influenced by sources from within Cooper Lighting Solutions or from external interests.



**Test Information**

Test Method: LM-79-08  
Report Number: P860197  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G3-2404-343-6)  
Test Lab: INNOVATION CENTER  
Issue Date: 7/11/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: METALUX  
Catalog Number: SPHB-48SE-W-L740-CD  
Description: 48000 Lumen Standard Efficacy Select Pro High Bay with Wide Lens  
and, 4000K 70CRI LEDs  
Light Source: -  
Ballast/Driver: -

Luminaire Equipment: Sample No.   Condition   Description

**Summary**

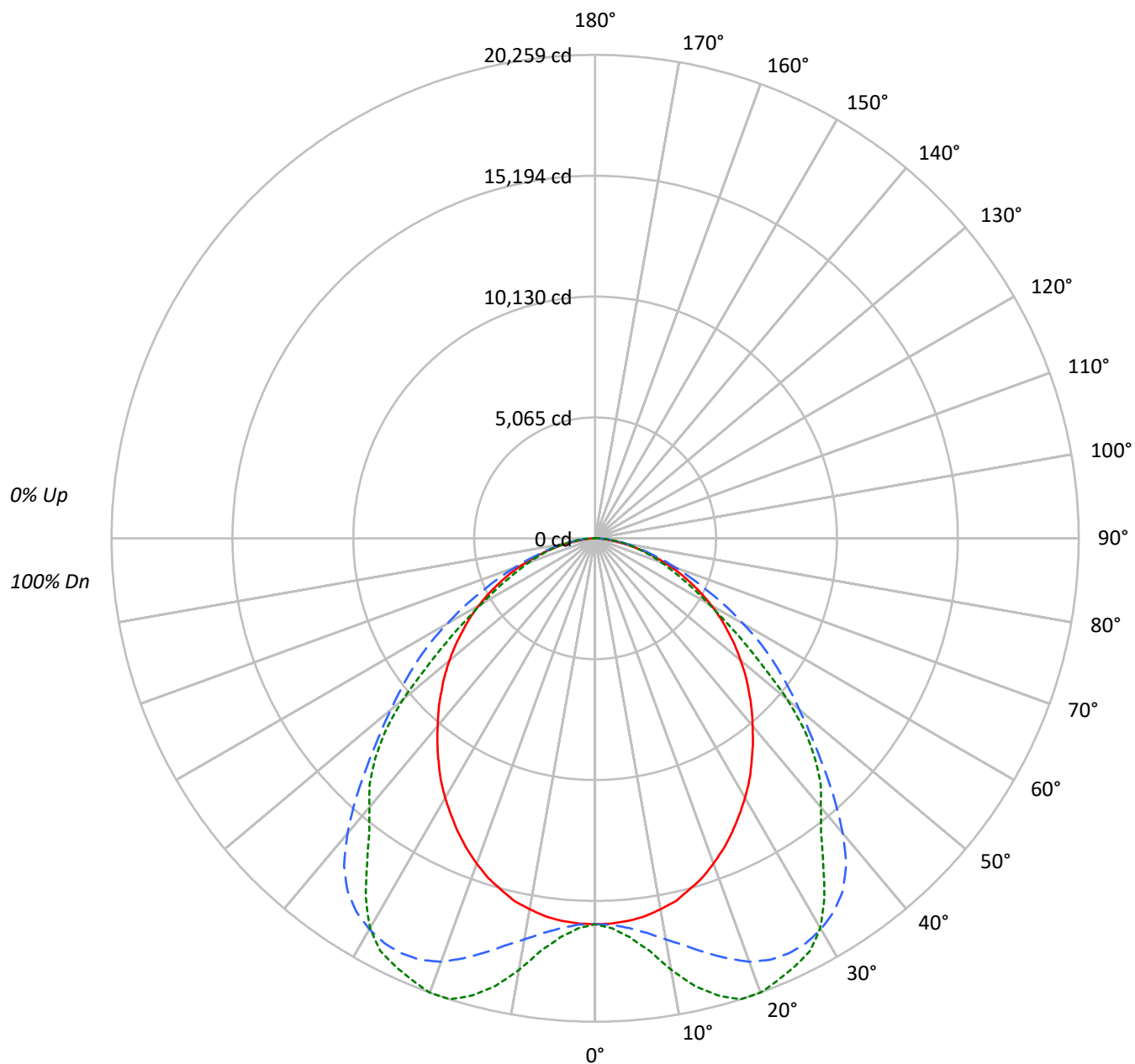
Lumens per Lamp: N/A  
Luminaire Lumens: 50885.0 lumens  
Efficiency: N/A  
Efficacy: 166.9 lumens/watt  
Spacing Criteria (0/90/45): 1.16 / 1.5 / 1.51  
Luminous Opening: Rectangular (W 1' x L: 3.38' x H: 0')  
CIE Type: Direct

Input Watts (W): 304.9  
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: P860197

CATALOG NUMBER: SPHB-48SE-W-L740-CD

### Luminous Intensity Polar Plot





TEST NUMBER: P860197

CATALOG NUMBER: SPHB-48SE-W-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  | 50  | 30 | 10 |
| RCR |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |
| 0   | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 | 106 | 106 | 106 | 102 | 102 | 102 | 100 |    |    |
| 1   | 110 | 105 | 101 | 98  | 107 | 103 | 99  | 96  | 99  | 96  | 93  | 95  | 92  | 90  | 91  | 89  | 87  | 85  |    |    |
| 2   | 100 | 92  | 86  | 81  | 98  | 91  | 85  | 80  | 87  | 82  | 78  | 84  | 80  | 76  | 81  | 77  | 74  | 72  |    |    |
| 3   | 92  | 82  | 74  | 68  | 89  | 80  | 73  | 67  | 77  | 71  | 66  | 74  | 69  | 65  | 72  | 67  | 64  | 62  |    |    |
| 4   | 84  | 73  | 64  | 58  | 82  | 71  | 63  | 57  | 69  | 62  | 57  | 66  | 61  | 56  | 64  | 59  | 55  | 53  |    |    |
| 5   | 77  | 65  | 56  | 50  | 75  | 64  | 56  | 50  | 62  | 55  | 49  | 60  | 54  | 49  | 58  | 52  | 48  | 46  |    |    |
| 6   | 72  | 59  | 50  | 44  | 70  | 58  | 49  | 43  | 56  | 49  | 43  | 54  | 48  | 43  | 53  | 47  | 42  | 40  |    |    |
| 7   | 66  | 53  | 45  | 39  | 65  | 52  | 44  | 38  | 51  | 43  | 38  | 49  | 43  | 38  | 48  | 42  | 38  | 36  |    |    |
| 8   | 62  | 48  | 40  | 34  | 60  | 48  | 40  | 34  | 46  | 39  | 34  | 45  | 39  | 34  | 44  | 38  | 34  | 32  |    |    |
| 9   | 58  | 44  | 36  | 31  | 56  | 44  | 36  | 31  | 43  | 36  | 31  | 42  | 35  | 30  | 41  | 35  | 30  | 29  |    |    |
| 10  | 54  | 41  | 33  | 28  | 53  | 40  | 33  | 28  | 39  | 33  | 28  | 39  | 32  | 28  | 38  | 32  | 28  | 26  |    |    |

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

|     | 0°    | 45°   | 90°   |
|-----|-------|-------|-------|
| 0°  | 51501 | 51501 | 51501 |
| 5°  | 51446 | 52416 | 53659 |
| 10° | 51039 | 55182 | 59365 |
| 15° | 50241 | 59291 | 65391 |
| 20° | 49154 | 64006 | 68657 |
| 25° | 47735 | 67459 | 69558 |
| 30° | 46181 | 69570 | 69369 |
| 35° | 44448 | 70269 | 64728 |
| 40° | 42657 | 67095 | 61137 |
| 45° | 41043 | 60818 | 58657 |
| 50° | 39444 | 55300 | 52000 |
| 55° | 37640 | 51093 | 42315 |
| 60° | 35778 | 45551 | 34850 |
| 65° | 33314 | 39141 | 30218 |
| 70° | 30309 | 33419 | 27330 |
| 75° | 26029 | 28045 | 25057 |
| 80° | 20344 | 24056 | 23240 |
| 85° | 13757 | 20414 | 19157 |



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CATALOG NUMBER: SPHB-48SE-W-L740-CD

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 1587.8  | 3.1       |
| 10°-20°   | 5034.8  | 9.9       |
| 20°-30°   | 8239.7  | 16.2      |
| 30°-40°   | 10051.9 | 19.8      |
| 40°-50°   | 9955.3  | 19.6      |
| 50°-60°   | 7961.0  | 15.6      |
| 60°-70°   | 4966.4  | 9.8       |
| 70°-80°   | 2433.3  | 4.8       |
| 80°-90°   | 638.2   | 1.3       |
| 90°-100°  | 16.8    | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-30°    | 14862.3 | 29.2      |
| 0°-40°    | 24914.2 | 49.0      |
| 0°-60°    | 42830.4 | 84.2      |
| 0°-90°    | 50868.2 | 100.0     |
| 90°-120°  | 16.8    | 0.0       |
| 90°-150°  | 16.8    | 0.0       |
| 90°-180°  | 17.0    | 0.0       |
| 0°-180°   | 50885.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°    | 22.5° | 45°   | 67.5° | 90°   | Flux |
|------|-------|-------|-------|-------|-------|------|
| 0°   | 16172 | 16172 | 16172 | 16172 | 16172 |      |
| 5°   | 16093 | 16164 | 16397 | 16682 | 16785 | ###  |
| 15°  | 15239 | 16126 | 17984 | 19415 | 19834 | 4296 |
| 25°  | 13585 | 15885 | 19198 | 19755 | 19796 | 6251 |
| 35°  | 11433 | 15277 | 18075 | 17109 | 16650 | 7152 |
| 45°  | 9113  | 14158 | 13504 | 13051 | 13024 | 7039 |
| 55°  | 6779  | 10870 | 9202  | 8314  | 7621  | 6074 |
| 65°  | 4421  | 6099  | 5194  | 4308  | 4010  | 4384 |
| 75°  | 2115  | 2591  | 2279  | 2087  | 2036  | 2246 |
| 85°  | 376   | 534   | 559   | 530   | 524   | 466  |
| 90°  | 2     | 55    | 99    | 126   | 130   | 22   |
| 95°  | 2     | 8     | 8     | 6     | 4     | 1    |
| 105° | 0     | 0     | 0     | 0     | 0     | 0    |
| 115° | 0     | 0     | 0     | 0     | 0     | 0    |
| 125° | 0     | 0     | 0     | 0     | 0     | 0    |
| 135° | 0     | 0     | 0     | 0     | 0     | 0    |
| 145° | 0     | 0     | 0     | 0     | 0     | 0    |
| 155° | 0     | 0     | 0     | 0     | 0     | 0    |
| 165° | 0     | 0     | 0     | 0     | 0     | 0    |
| 175° | 0     | 0     | 0     | 0     | 0     | 0    |
| 180° | 0     | 0     | 0     | 0     | 0     |      |



TEST NUMBER: P860197

CATALOG NUMBER: SPHB-48SE-W-L740-CD

**CANDELA DISTRIBUTION (FULL):**

|        | 0°      | 22.5°   | 45°     | 67.5°   | 90°     |
|--------|---------|---------|---------|---------|---------|
| 0°     | 16172.0 | 16172.0 | 16172.0 | 16172.0 | 16172.0 |
| 2.5°   | 16155.8 | 16149.7 | 16208.4 | 16315.7 | 16364.3 |
| 5°     | 16093.1 | 16163.9 | 16396.7 | 16682.1 | 16785.4 |
| 7.5°   | 15979.7 | 16170.0 | 16684.2 | 17208.4 | 17431.1 |
| 10°    | 15783.3 | 16174.0 | 17064.7 | 17989.8 | 18358.2 |
| 12.5°  | 15580.9 | 16159.9 | 17487.8 | 18797.5 | 19200.3 |
| 15°    | 15238.8 | 16125.5 | 17983.7 | 19414.9 | 19833.9 |
| 17.5°  | 14921.0 | 16085.0 | 18461.5 | 19939.2 | 20257.0 |
| 20°    | 14504.0 | 16026.3 | 18886.6 | 20099.1 | 20259.0 |
| 22.5°  | 14066.8 | 15979.7 | 19121.4 | 19991.8 | 20040.4 |
| 25°    | 13585.0 | 15884.6 | 19198.3 | 19755.0 | 19795.5 |
| 27.5°  | 13070.8 | 15799.5 | 19125.4 | 19461.5 | 19495.9 |
| 30°    | 12558.7 | 15645.7 | 18919.0 | 19004.0 | 18864.3 |
| 32.5°  | 12022.2 | 15491.9 | 18585.0 | 18202.4 | 17876.5 |
| 35°    | 11433.2 | 15277.3 | 18074.8 | 17109.3 | 16649.7 |
| 37.5°  | 10852.2 | 15070.8 | 17279.3 | 15886.6 | 15540.4 |
| 40°    | 10261.1 | 14815.7 | 16139.6 | 14744.9 | 14706.4 |
| 42.5°  | 9702.4  | 14540.4 | 14850.2 | 13856.2 | 13985.8 |
| 45°    | 9113.3  | 14157.8 | 13504.0 | 13050.6 | 13024.2 |
| 47.5°  | 8554.6  | 13629.5 | 12279.3 | 12159.9 | 11890.6 |
| 50°    | 7961.5  | 12900.8 | 11161.9 | 11048.5 | 10495.9 |
| 52.5°  | 7380.5  | 11971.6 | 10163.9 | 9738.8  | 8933.2  |
| 55°    | 6779.3  | 10870.4 | 9202.4  | 8313.7  | 7621.4  |
| 57.5°  | 6220.6  | 9659.9  | 8224.7  | 7072.9  | 6451.4  |
| 60°    | 5617.4  | 8433.2  | 7151.8  | 5983.8  | 5471.6  |
| 62.5°  | 5026.3  | 7224.7  | 6180.1  | 5056.7  | 4716.6  |
| 65°    | 4421.0  | 6099.2  | 5194.3  | 4307.7  | 4010.1  |
| 67.5°  | 3842.1  | 5125.5  | 4342.1  | 3631.6  | 3433.2  |
| 70°    | 3255.1  | 4157.9  | 3589.1  | 3050.6  | 2935.2  |
| 72.5°  | 2649.8  | 3321.9  | 2902.8  | 2574.9  | 2487.8  |
| 75°    | 2115.4  | 2591.1  | 2279.3  | 2087.0  | 2036.4  |
| 77.5°  | 1574.9  | 1927.1  | 1781.4  | 1668.0  | 1653.8  |
| 80°    | 1109.3  | 1390.7  | 1311.7  | 1289.5  | 1267.2  |
| 82.5°  | 708.5   | 908.9   | 933.2   | 919.0   | 902.8   |
| 85°    | 376.5   | 534.4   | 558.7   | 530.4   | 524.3   |
| 87.5°  | 151.8   | 232.8   | 251.0   | 277.3   | 285.4   |
| 90°    | 2.0     | 54.7    | 99.2    | 125.5   | 129.6   |
| 92.5°  | 2.0     | 12.1    | 14.2    | 14.2    | 12.1    |
| 95°    | 2.0     | 8.1     | 8.1     | 6.1     | 4.0     |
| 97.5°  | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     |
| 100°   | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     |
| 102.5° | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     |
| 105°   | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     |



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**CANDELA DISTRIBUTION (continued):**

|        | 0°  | 22.5° | 45° | 67.5° | 90° |
|--------|-----|-------|-----|-------|-----|
| 112.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 115°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 117.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 120°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 122.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 125°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 127.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 130°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 132.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 135°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 137.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 140°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 142.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 145°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 147.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 150°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 152.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 155°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 157.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 160°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 162.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 165°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 167.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 170°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 172.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 175°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 177.5° | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |
| 180°   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 |



Report Generated By 670246072 / DESKTOP-50001EG





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







|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| 107.5° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 110°   | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |



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

Report Prepared for

Cooper Lighting Solutions

METALUX

Report Number: SP1-2404-343-2

Test Date: 05/18/2024

Luminaire Tested: SPHB-24SE-M-UNV-L740-CD

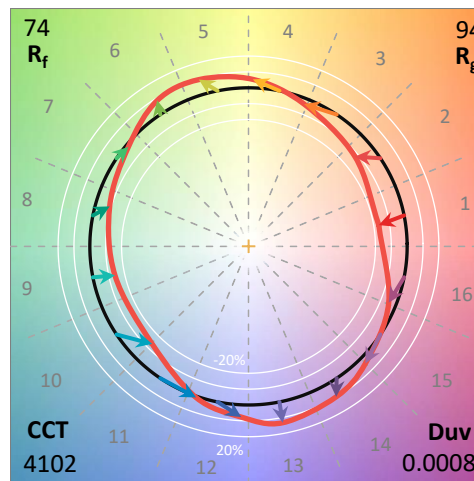
Data in this report applies to families of products SPHB-24SE-M-UNV-L740-CD.

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2404-343-2  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 05/21/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: METALUX  
 Catalog Number: **SPHB-24SE-M-UNV-L740-CD**  
 Description: 18IN SPHB WITH MEDIUM LENS, 4000K/70CRI, 24K LUMENS, SE

### Spectral Parameters

|                           |        |           |      |      |       |
|---------------------------|--------|-----------|------|------|-------|
| CCT (K):                  | 4102   | CRI (Ra): | 71.8 |      |       |
| CIE u':                   | 0.2228 | R1:       | 68.8 | R9:  | -28.8 |
| CIE v':                   | 0.5006 | R2:       | 78.2 | R10: | 48.0  |
| Duv:                      | 0.0008 | R3:       | 85.2 | R11: | 66.0  |
| CIE x:                    | 0.3764 | R4:       | 70.9 | R12: | 40.8  |
| CIE y:                    | 0.3759 | R5:       | 68.5 | R13: | 70.2  |
| CIE z:                    | 0.2476 | R6:       | 68.8 | R14: | 91.5  |
| Peak Wavelength (nm):     | 449    | R7:       | 81.1 |      |       |
| Dominant Wavelength (nm): | 578    | R8:       | 53.2 |      |       |
| Purity:                   | 25.9   |           |      |      |       |
| Rf:                       | 73.6   |           |      |      |       |
| Rg:                       | 94.1   |           |      |      |       |



### Test Conditions

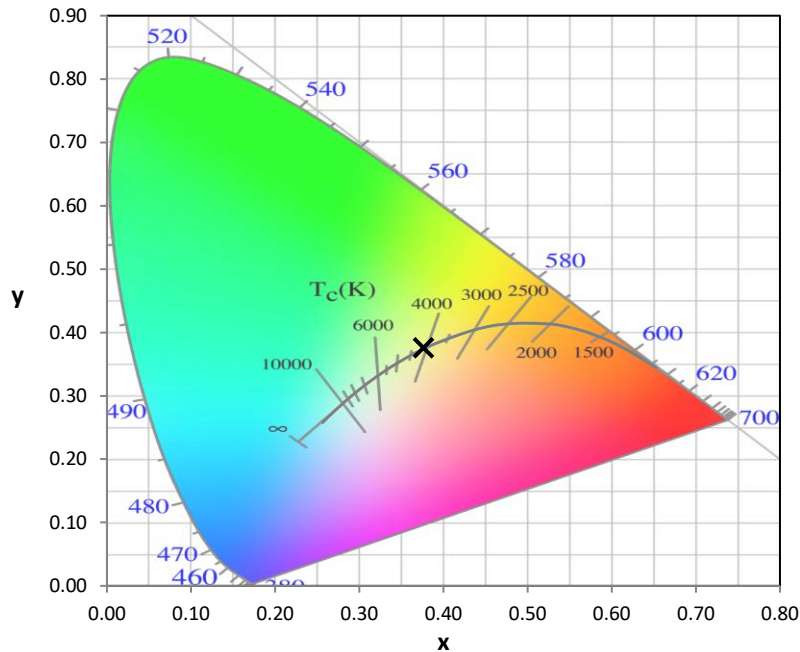
Stabilization Time: 23M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.0/42%  
 Sphere Temperature (°C): 25.2

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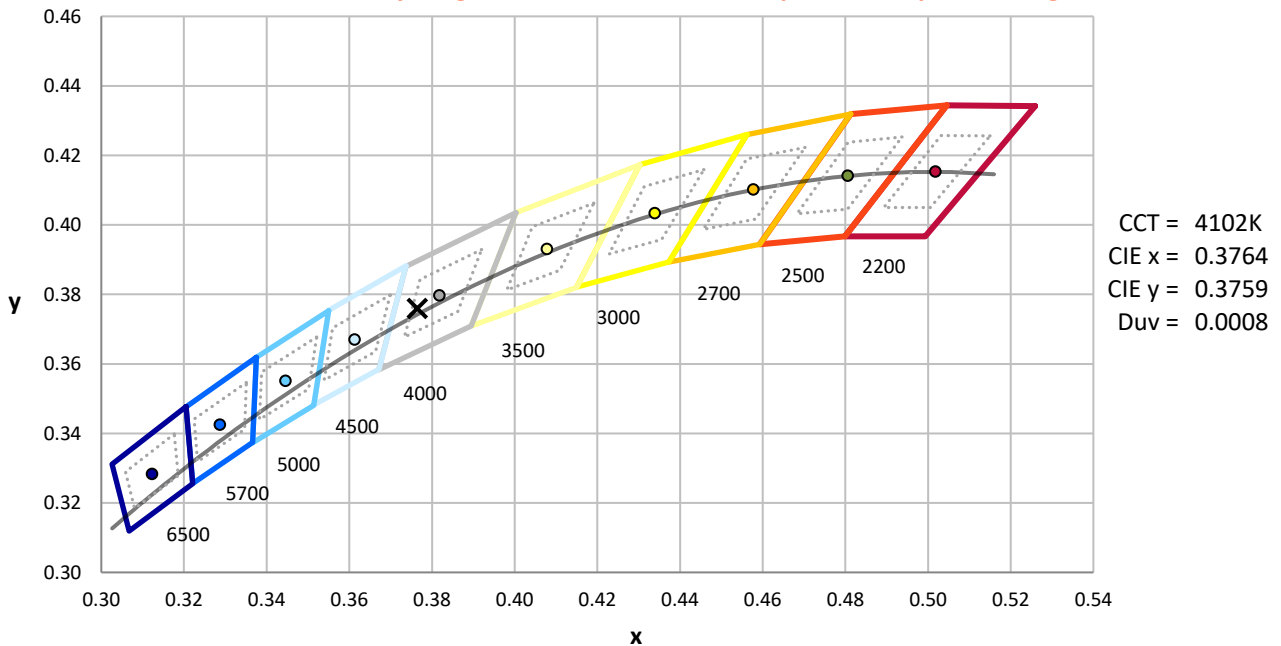
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | 76INCH SPHERE IN0058  | 2/12/2024        | 8/12/2024            |
| Power Meter                    | XITRON 2801 IN0071    | 10/23/2023       | 10/23/2024           |
| AC Power Source                | CHROMA 61603 IN0063   | 10/24/2023       | 10/24/2024           |
| DC Power Source                | AGILENT E3634A IN0208 | 10/24/2023       | 10/24/2024           |
| Sphere Thermometer             | ONSET IN0085          | 10/24/2023       | 10/24/2024           |
| Room Thermometer               | ONSET IN0046          | 10/24/2023       | 10/24/2024           |

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CIE 1931 Chromaticity Diagram



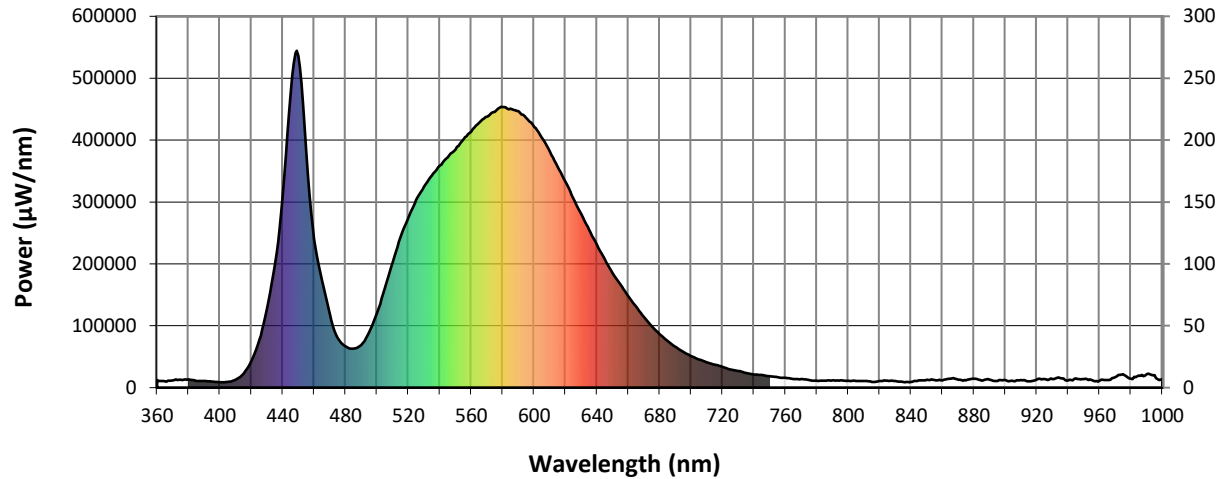
CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



Point lies inside the ANSI 4000K 4-step quadrangle

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**Photopic Flux vs. Wavelength**

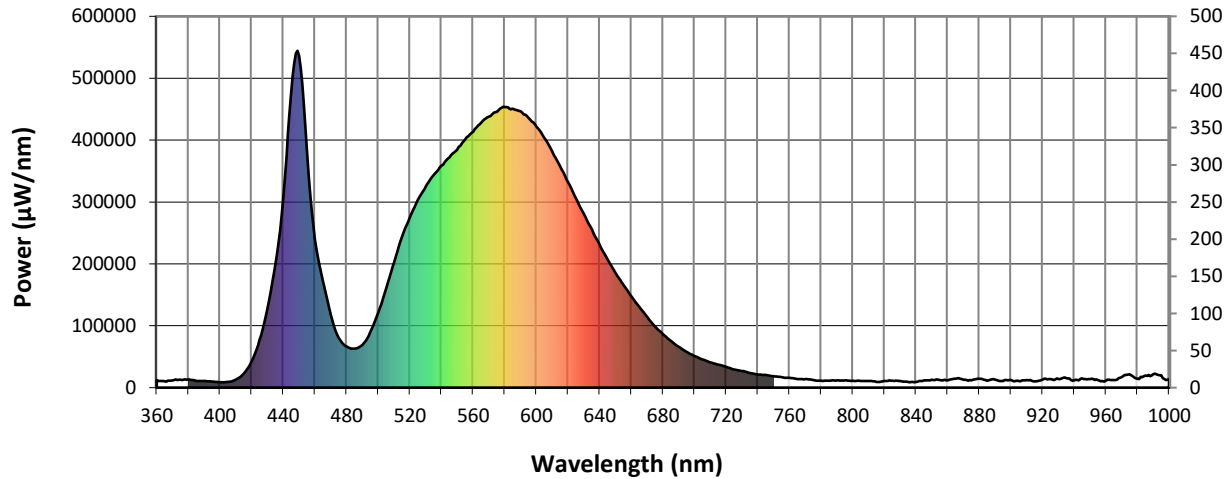


#####

| 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       | 12282            | NR               | 490       | 69244            | NR               | 620       | 332236           | NR               | 750       | 18473            | NR               | 880       | 14144            | NR               |
| 365       | 9993             | NR               | 495       | 89219            | NR               | 625       | 306164           | NR               | 755       | 17093            | NR               | 885       | 11383            | NR               |
| 370       | 11592            | NR               | 500       | 120957           | NR               | 630       | 280415           | NR               | 760       | 15783            | NR               | 890       | 12631            | NR               |
| 375       | 12885            | NR               | 505       | 160415           | NR               | 635       | 255776           | NR               | 765       | 14109            | NR               | 895       | 10943            | NR               |
| 380       | 13155            | NR               | 510       | 202325           | NR               | 640       | 230858           | NR               | 770       | 13714            | NR               | 900       | 12076            | NR               |
| 385       | 10524            | NR               | 515       | 242772           | NR               | 645       | 207176           | NR               | 775       | 12109            | NR               | 905       | 10813            | NR               |
| 390       | 10533            | NR               | 520       | 275166           | NR               | 650       | 185102           | NR               | 780       | 11079            | NR               | 910       | 12050            | NR               |
| 395       | 9702             | NR               | 525       | 303387           | NR               | 655       | 166605           | NR               | 785       | 11015            | NR               | 915       | 10223            | NR               |
| 400       | 8761             | NR               | 530       | 324891           | NR               | 660       | 147603           | NR               | 790       | 11633            | NR               | 920       | 13013            | NR               |
| 405       | 9408             | NR               | 535       | 343444           | NR               | 665       | 130499           | NR               | 795       | 11716            | NR               | 925       | 13830            | NR               |
| 410       | 12905            | NR               | 540       | 358519           | NR               | 670       | 114031           | NR               | 800       | 11203            | NR               | 930       | 13673            | NR               |
| 415       | 22586            | NR               | 545       | 372186           | NR               | 675       | 98947            | NR               | 805       | 11009            | NR               | 935       | 15350            | NR               |
| 420       | 42669            | NR               | 550       | 384765           | NR               | 680       | 86467            | NR               | 810       | 10663            | NR               | 940       | 11647            | NR               |
| 425       | 76871            | NR               | 555       | 400929           | NR               | 685       | 75462            | NR               | 815       | 9337             | NR               | 945       | 14902            | NR               |
| 430       | 127767           | NR               | 560       | 413604           | NR               | 690       | 66059            | NR               | 820       | 10799            | NR               | 950       | 13879            | NR               |
| 435       | 199683           | NR               | 565       | 427985           | NR               | 695       | 57993            | NR               | 825       | 11459            | NR               | 955       | 12239            | NR               |
| 440       | 309359           | NR               | 570       | 437799           | NR               | 700       | 51050            | NR               | 830       | 10962            | NR               | 960       | 11457            | NR               |
| 445       | 475498           | NR               | 575       | 445619           | NR               | 705       | 45397            | NR               | 835       | 9293             | NR               | 965       | 12396            | NR               |
| 450       | 536068           | NR               | 580       | 453529           | NR               | 710       | 40983            | NR               | 840       | 9002             | NR               | 970       | 16946            | NR               |
| 455       | 378779           | NR               | 585       | 450693           | NR               | 715       | 37088            | NR               | 845       | 11803            | NR               | 975       | 21468            | NR               |
| 460       | 240574           | NR               | 590       | 446550           | NR               | 720       | 33495            | NR               | 850       | 12750            | NR               | 980       | 14395            | NR               |
| 465       | 173120           | NR               | 595       | 435850           | NR               | 725       | 29505            | NR               | 855       | 12369            | NR               | 985       | 19422            | NR               |
| 470       | 117570           | NR               | 600       | 421525           | NR               | 730       | 26895            | NR               | 860       | 11712            | NR               | 990       | 21623            | NR               |
| 475       | 80285            | NR               | 605       | 403930           | NR               | 735       | 23678            | NR               | 865       | 14509            | NR               | 995       | 20190            | NR               |
| 480       | 66424            | NR               | 610       | 381413           | NR               | 740       | 21288            | NR               | 870       | 12667            | NR               | 1000      | 13819            | NR               |
| 485       | 63033            | NR               | 615       | 357334           | NR               | 745       | 20448            | NR               | 875       | 11947            | NR               |           |                  |                  |

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Scotopic Flux vs. Wavelength



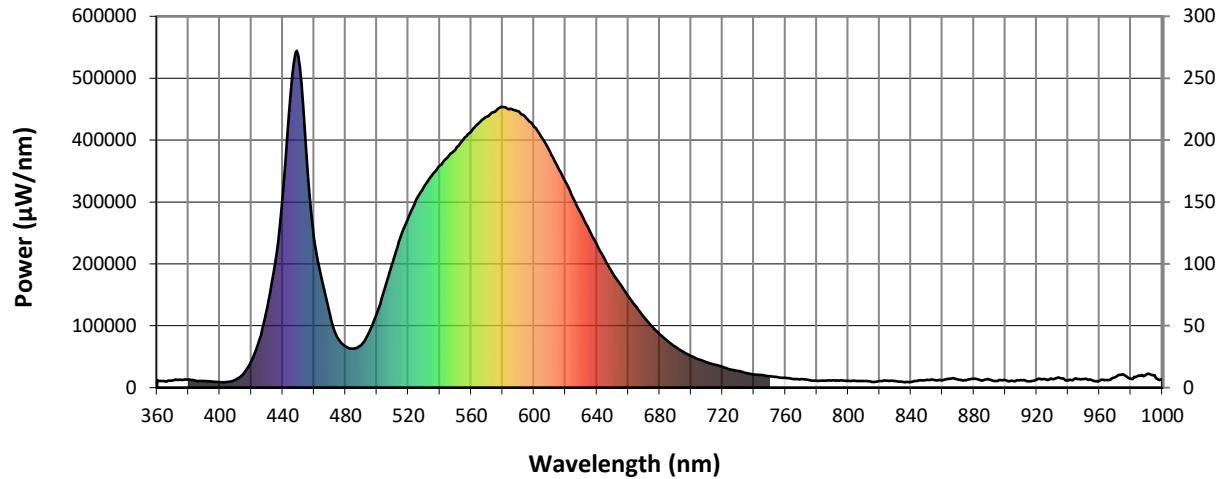
Scotopic Lumens: 39135.7

S/P: 1.54

| 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       | 12282            | NR               | 490       | 69244            | NR               | 620       | 332236           | NR               | 750       | 18473            | NR               | 880       | 14144            | NR               |
| 365       | 9993             | NR               | 495       | 89219            | NR               | 625       | 306164           | NR               | 755       | 17093            | NR               | 885       | 11383            | NR               |
| 370       | 11592            | NR               | 500       | 120957           | NR               | 630       | 280415           | NR               | 760       | 15783            | NR               | 890       | 12631            | NR               |
| 375       | 12885            | NR               | 505       | 160415           | NR               | 635       | 255776           | NR               | 765       | 14109            | NR               | 895       | 10943            | NR               |
| 380       | 13155            | NR               | 510       | 202325           | NR               | 640       | 230858           | NR               | 770       | 13714            | NR               | 900       | 12076            | NR               |
| 385       | 10524            | NR               | 515       | 242772           | NR               | 645       | 207176           | NR               | 775       | 12109            | NR               | 905       | 10813            | NR               |
| 390       | 10533            | NR               | 520       | 275166           | NR               | 650       | 185102           | NR               | 780       | 11079            | NR               | 910       | 12050            | NR               |
| 395       | 9702             | NR               | 525       | 303387           | NR               | 655       | 166605           | NR               | 785       | 11015            | NR               | 915       | 10223            | NR               |
| 400       | 8761             | NR               | 530       | 324891           | NR               | 660       | 147603           | NR               | 790       | 11633            | NR               | 920       | 13013            | NR               |
| 405       | 9408             | NR               | 535       | 343444           | NR               | 665       | 130499           | NR               | 795       | 11716            | NR               | 925       | 13830            | NR               |
| 410       | 12905            | NR               | 540       | 358519           | NR               | 670       | 114031           | NR               | 800       | 11203            | NR               | 930       | 13673            | NR               |
| 415       | 22586            | NR               | 545       | 372186           | NR               | 675       | 98947            | NR               | 805       | 11009            | NR               | 935       | 15350            | NR               |
| 420       | 42669            | NR               | 550       | 384765           | NR               | 680       | 86467            | NR               | 810       | 10663            | NR               | 940       | 11647            | NR               |
| 425       | 76871            | NR               | 555       | 400929           | NR               | 685       | 75462            | NR               | 815       | 9337             | NR               | 945       | 14902            | NR               |
| 430       | 127767           | NR               | 560       | 413604           | NR               | 690       | 66059            | NR               | 820       | 10799            | NR               | 950       | 13879            | NR               |
| 435       | 199683           | NR               | 565       | 427985           | NR               | 695       | 57993            | NR               | 825       | 11459            | NR               | 955       | 12239            | NR               |
| 440       | 309359           | NR               | 570       | 437799           | NR               | 700       | 51050            | NR               | 830       | 10962            | NR               | 960       | 11457            | NR               |
| 445       | 475498           | NR               | 575       | 445619           | NR               | 705       | 45397            | NR               | 835       | 9293             | NR               | 965       | 12396            | NR               |
| 450       | 536068           | NR               | 580       | 453529           | NR               | 710       | 40983            | NR               | 840       | 9002             | NR               | 970       | 16946            | NR               |
| 455       | 378779           | NR               | 585       | 450693           | NR               | 715       | 37088            | NR               | 845       | 11803            | NR               | 975       | 21468            | NR               |
| 460       | 240574           | NR               | 590       | 446550           | NR               | 720       | 33495            | NR               | 850       | 12750            | NR               | 980       | 14395            | NR               |
| 465       | 173120           | NR               | 595       | 435850           | NR               | 725       | 29505            | NR               | 855       | 12369            | NR               | 985       | 19422            | NR               |
| 470       | 117570           | NR               | 600       | 421525           | NR               | 730       | 26895            | NR               | 860       | 11712            | NR               | 990       | 21623            | NR               |
| 475       | 80285            | NR               | 605       | 403930           | NR               | 735       | 23678            | NR               | 865       | 14509            | NR               | 995       | 20190            | NR               |
| 480       | 66424            | NR               | 610       | 381413           | NR               | 740       | 21288            | NR               | 870       | 12667            | NR               | 1000      | 13819            | NR               |
| 485       | 63033            | NR               | 615       | 357334           | NR               | 745       | 20448            | NR               | 875       | 11947            | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 15130.5 M/P: 0.6**

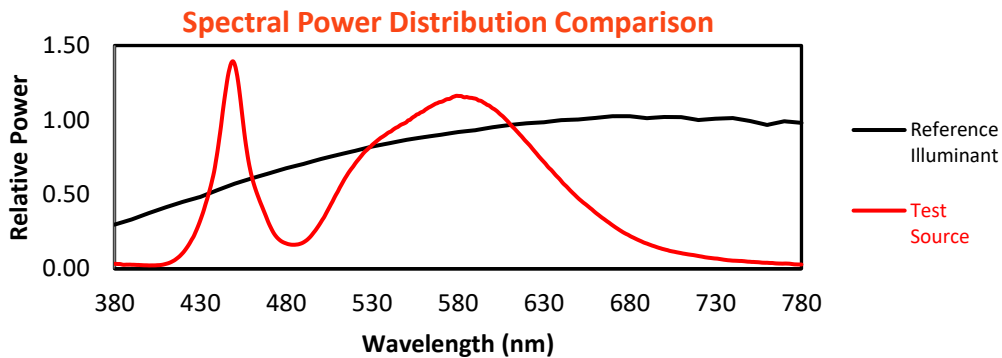
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 12282            | NR               | 490       | 69244            | NR               | 620       | 332236           | NR               | 750       | 18473            | NR               | 880       | 14144            | NR               |
| 365       | 9993             | NR               | 495       | 89219            | NR               | 625       | 306164           | NR               | 755       | 17093            | NR               | 885       | 11383            | NR               |
| 370       | 11592            | NR               | 500       | 120957           | NR               | 630       | 280415           | NR               | 760       | 15783            | NR               | 890       | 12631            | NR               |
| 375       | 12885            | NR               | 505       | 160415           | NR               | 635       | 255776           | NR               | 765       | 14109            | NR               | 895       | 10943            | NR               |
| 380       | 13155            | NR               | 510       | 202325           | NR               | 640       | 230858           | NR               | 770       | 13714            | NR               | 900       | 12076            | NR               |
| 385       | 10524            | NR               | 515       | 242772           | NR               | 645       | 207176           | NR               | 775       | 12109            | NR               | 905       | 10813            | NR               |
| 390       | 10533            | NR               | 520       | 275166           | NR               | 650       | 185102           | NR               | 780       | 11079            | NR               | 910       | 12050            | NR               |
| 395       | 9702             | NR               | 525       | 303387           | NR               | 655       | 166605           | NR               | 785       | 11015            | NR               | 915       | 10223            | NR               |
| 400       | 8761             | NR               | 530       | 324891           | NR               | 660       | 147603           | NR               | 790       | 11633            | NR               | 920       | 13013            | NR               |
| 405       | 9408             | NR               | 535       | 343444           | NR               | 665       | 130499           | NR               | 795       | 11716            | NR               | 925       | 13830            | NR               |
| 410       | 12905            | NR               | 540       | 358519           | NR               | 670       | 114031           | NR               | 800       | 11203            | NR               | 930       | 13673            | NR               |
| 415       | 22586            | NR               | 545       | 372186           | NR               | 675       | 98947            | NR               | 805       | 11009            | NR               | 935       | 15350            | NR               |
| 420       | 42669            | NR               | 550       | 384765           | NR               | 680       | 86467            | NR               | 810       | 10663            | NR               | 940       | 11647            | NR               |
| 425       | 76871            | NR               | 555       | 400929           | NR               | 685       | 75462            | NR               | 815       | 9337             | NR               | 945       | 14902            | NR               |
| 430       | 127767           | NR               | 560       | 413604           | NR               | 690       | 66059            | NR               | 820       | 10799            | NR               | 950       | 13879            | NR               |
| 435       | 199683           | NR               | 565       | 427985           | NR               | 695       | 57993            | NR               | 825       | 11459            | NR               | 955       | 12239            | NR               |
| 440       | 309359           | NR               | 570       | 437799           | NR               | 700       | 51050            | NR               | 830       | 10962            | NR               | 960       | 11457            | NR               |
| 445       | 475498           | NR               | 575       | 445619           | NR               | 705       | 45397            | NR               | 835       | 9293             | NR               | 965       | 12396            | NR               |
| 450       | 536068           | NR               | 580       | 453529           | NR               | 710       | 40983            | NR               | 840       | 9002             | NR               | 970       | 16946            | NR               |
| 455       | 378779           | NR               | 585       | 450693           | NR               | 715       | 37088            | NR               | 845       | 11803            | NR               | 975       | 21468            | NR               |
| 460       | 240574           | NR               | 590       | 446550           | NR               | 720       | 33495            | NR               | 850       | 12750            | NR               | 980       | 14395            | NR               |
| 465       | 173120           | NR               | 595       | 435850           | NR               | 725       | 29505            | NR               | 855       | 12369            | NR               | 985       | 19422            | NR               |
| 470       | 117570           | NR               | 600       | 421525           | NR               | 730       | 26895            | NR               | 860       | 11712            | NR               | 990       | 21623            | NR               |
| 475       | 80285            | NR               | 605       | 403930           | NR               | 735       | 23678            | NR               | 865       | 14509            | NR               | 995       | 20190            | NR               |
| 480       | 66424            | NR               | 610       | 381413           | NR               | 740       | 21288            | NR               | 870       | 12667            | NR               | 1000      | 13819            | NR               |
| 485       | 63033            | NR               | 615       | 357334           | NR               | 745       | 20448            | NR               | 875       | 11947            | NR               |           |                  |                  |

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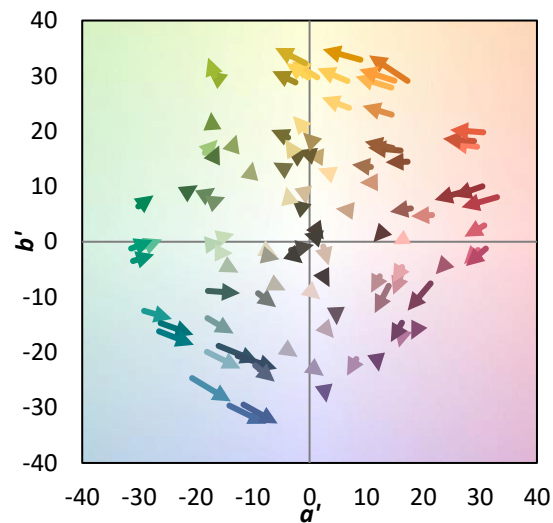
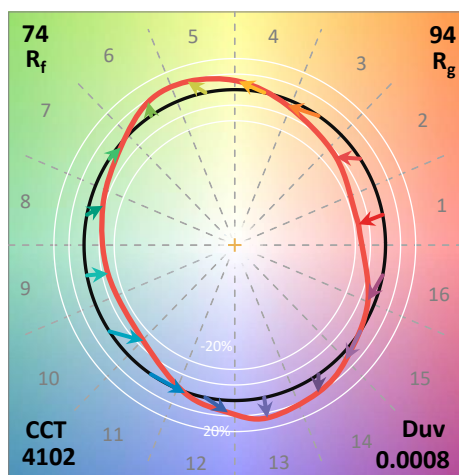
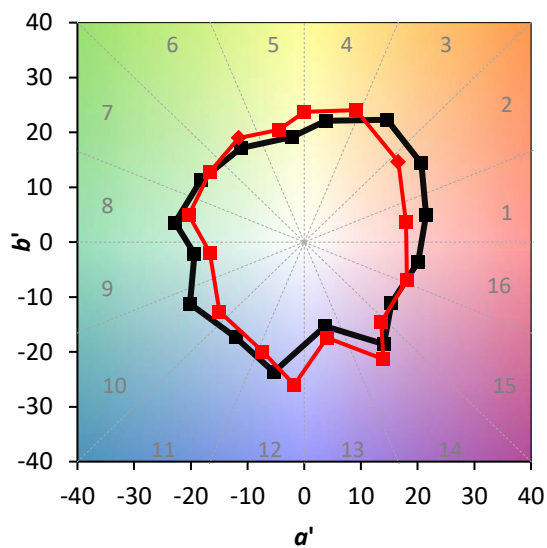
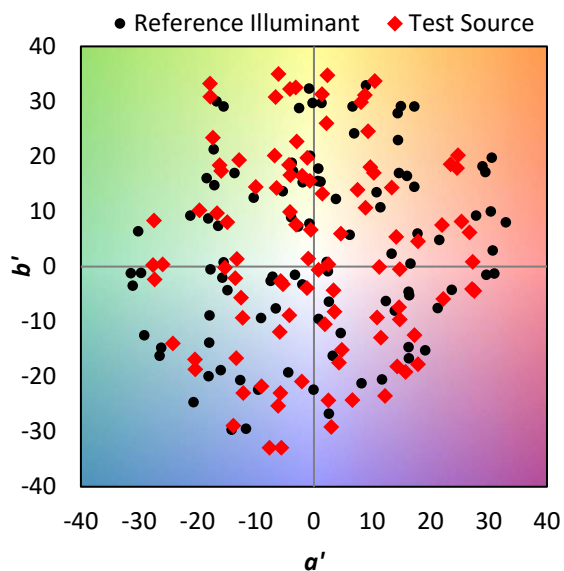
**TM-30-18**

**Summary**

$R_f = 73.6$   
 $R_g = 94.1$   
 CIE  $R_a = 71.8$   
 $R_g = -28.8$



**Color Vector Graphics**

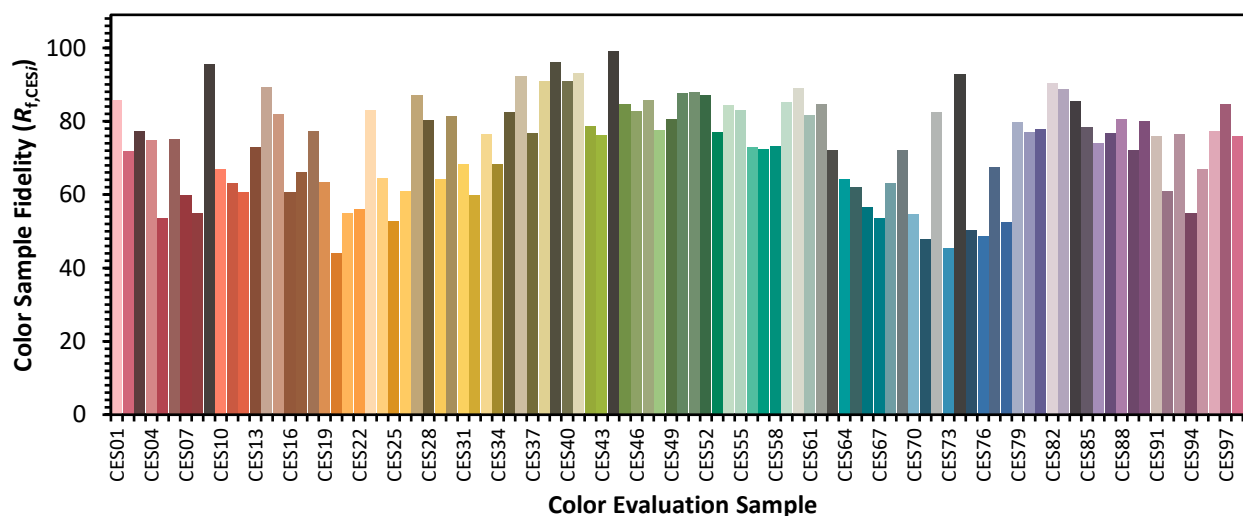


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**Individual Sample Fidelity Index ( $R_{f,i}$ )**

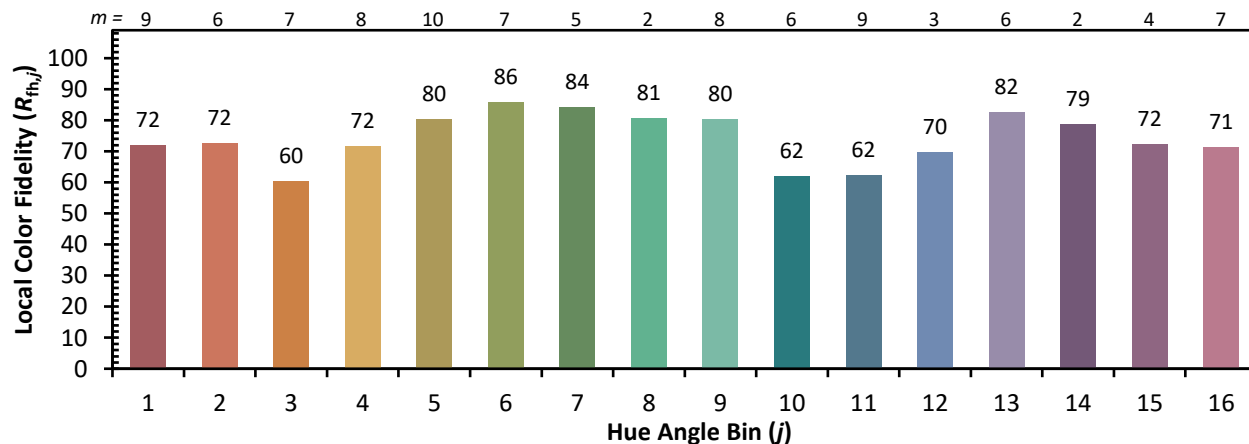
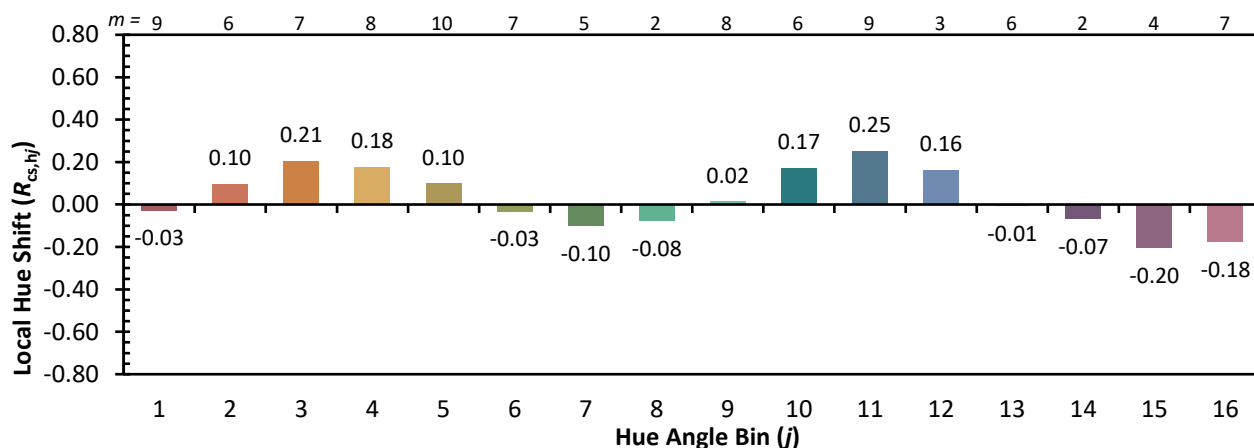
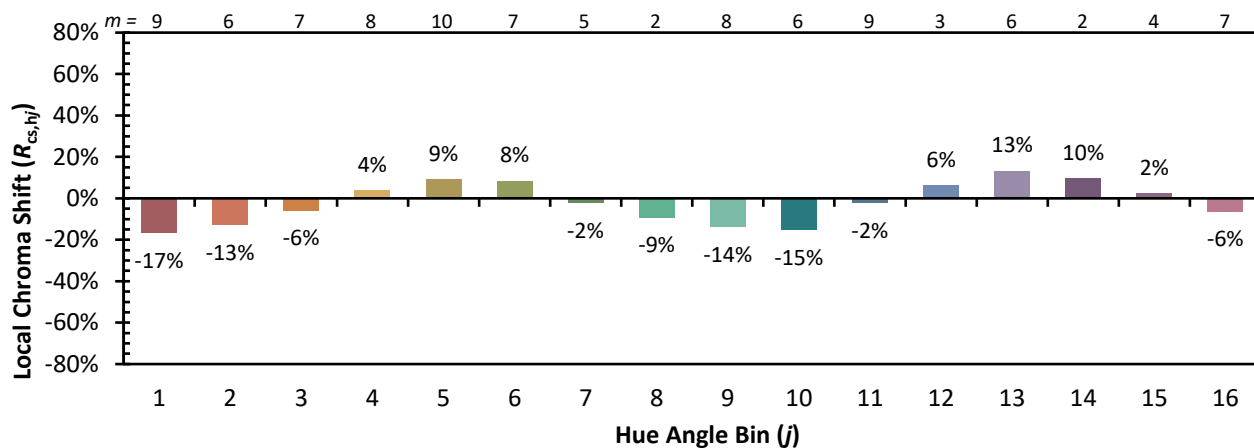
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 61 | CES51 = 88 | CES76 = 49 |
| CES02 = 60 | CES27 = 87 | CES52 = 87 | CES77 = 67 |
| CES03 = 30 | CES28 = 80 | CES53 = 77 | CES78 = 52 |
| CES04 = 70 | CES29 = 64 | CES54 = 85 | CES79 = 80 |
| CES05 = 47 | CES30 = 81 | CES55 = 83 | CES80 = 77 |
| CES06 = 50 | CES31 = 68 | CES56 = 73 | CES81 = 78 |
| CES07 = 40 | CES32 = 60 | CES57 = 72 | CES82 = 90 |
| CES08 = 39 | CES33 = 77 | CES58 = 73 | CES83 = 89 |
| CES09 = 29 | CES34 = 68 | CES59 = 85 | CES84 = 85 |
| CES10 = 74 | CES35 = 82 | CES60 = 89 | CES85 = 78 |
| CES11 = 57 | CES36 = 92 | CES61 = 82 | CES86 = 74 |
| CES12 = 63 | CES37 = 77 | CES62 = 85 | CES87 = 77 |
| CES13 = 42 | CES38 = 91 | CES63 = 72 | CES88 = 81 |
| CES14 = 74 | CES39 = 96 | CES64 = 64 | CES89 = 72 |
| CES15 = 71 | CES40 = 91 | CES65 = 62 | CES90 = 80 |
| CES16 = 46 | CES41 = 93 | CES66 = 56 | CES91 = 76 |
| CES17 = 49 | CES42 = 79 | CES67 = 54 | CES92 = 61 |
| CES18 = 56 | CES43 = 76 | CES68 = 63 | CES93 = 76 |
| CES19 = 71 | CES44 = 99 | CES69 = 72 | CES94 = 55 |
| CES20 = 64 | CES45 = 85 | CES70 = 55 | CES95 = 67 |
| CES21 = 86 | CES46 = 83 | CES71 = 48 | CES96 = 77 |
| CES22 = 78 | CES47 = 86 | CES72 = 82 | CES97 = 85 |
| CES23 = 92 | CES48 = 78 | CES73 = 45 | CES98 = 76 |
| CES24 = 91 | CES49 = 81 | CES74 = 93 | CES99 = 64 |
| CES25 = 72 | CES50 = 88 | CES75 = 50 |            |



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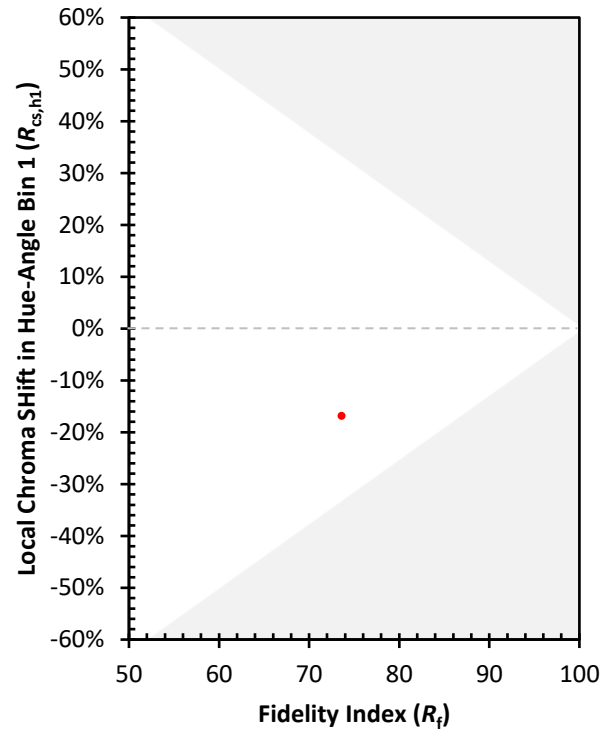
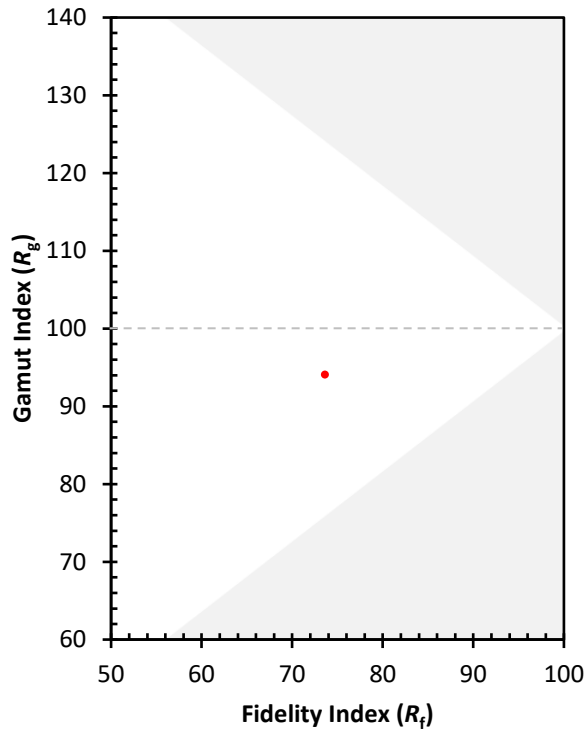
Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)