

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: P828591

Luminaire Tested: **OHBL-18HE-A-UNV-L950-CD-UPL12**

Issue Date: 5/3/2024



**Test Information**

Test Method: LM-79-08  
Report Number: P828591  
REPORT IS A COMBINATION OF REPORTS P826059 AND G3-2310-221-12  
Test Lab: INNOVATION CENTER  
Issue Date: 5/3/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: METALUX  
Catalog Number: OHBL-18HE-A-UNV-L950-CD-UPL12  
Description:  
Light Source: -  
Ballast/Driver: -

**Summary**

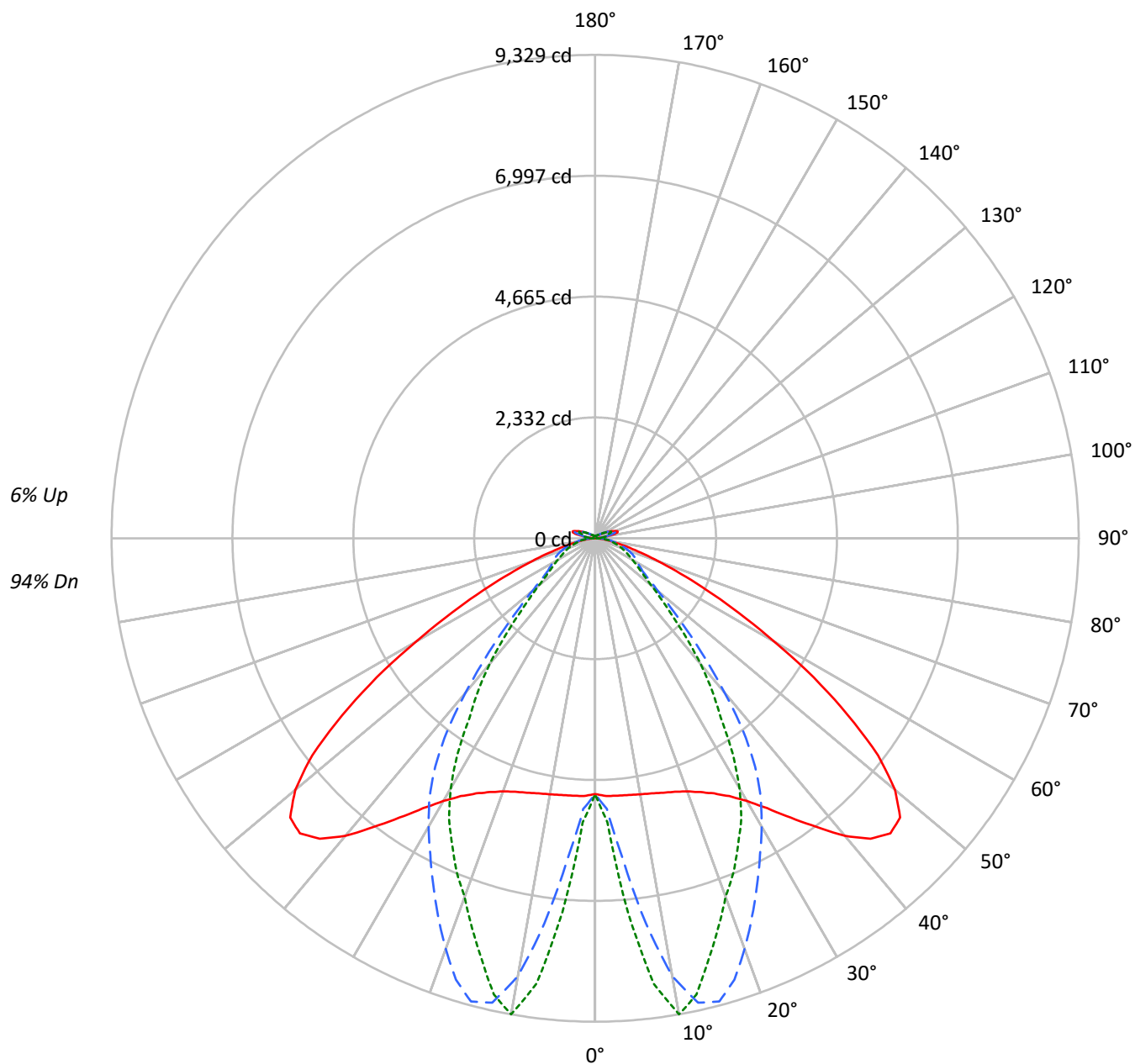
Lumens per Lamp: N/A  
Luminaire Lumens: 16924.0 lumens  
Efficiency: N/A  
Efficacy: 151.9 lumens/watt  
Spacing Criteria (0/90/45): 2.18 / 1.37 / 1.3  
Luminous Opening: Rectangular w/ Sides (W: 3.78' x L: 1.67' x H: 0.17')  
CIE Type: Direct

Input Watts (W): 111.4  
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: P828591

CATALOG NUMBER: OHBL-18HE-A-UNV-L950-CD-UPL12

### Luminous Intensity Polar Plot





TEST NUMBER: P828591

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

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|
| RF  | 20  |     |     |     | 20  |     |     |     |     | 20  |     |     |     |     | 20 |    |    |    |    | 20 |
| RC  | 80  |     |     |     | 70  |     |     |     |     | 50  |     |     |     |     | 30 |    |    |    |    | 10 |
| RW  | 70  | 50  | 30  | 10  | 70  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50 | 30 | 10 | 50 | 30 | 10 |
| RCR |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |
| 0   | 118 | 118 | 118 | 118 | 114 | 114 | 114 | 114 | 108 | 108 | 108 | 102 | 102 | 102 | 96 | 96 | 96 | 94 |    |    |
| 1   | 109 | 105 | 102 | 98  | 106 | 102 | 99  | 96  | 97  | 94  | 92  | 92  | 90  | 88  | 87 | 86 | 84 | 82 |    |    |
| 2   | 101 | 94  | 88  | 83  | 98  | 92  | 86  | 82  | 87  | 83  | 79  | 83  | 79  | 76  | 79 | 76 | 74 | 71 |    |    |
| 3   | 93  | 84  | 77  | 72  | 90  | 82  | 76  | 71  | 78  | 73  | 69  | 75  | 71  | 67  | 72 | 68 | 65 | 63 |    |    |
| 4   | 86  | 76  | 68  | 63  | 84  | 74  | 67  | 62  | 71  | 65  | 60  | 68  | 63  | 59  | 65 | 61 | 57 | 55 |    |    |
| 5   | 80  | 69  | 61  | 55  | 78  | 67  | 60  | 55  | 65  | 58  | 53  | 62  | 57  | 52  | 60 | 55 | 51 | 49 |    |    |
| 6   | 75  | 63  | 55  | 49  | 72  | 62  | 54  | 49  | 59  | 53  | 48  | 57  | 51  | 47  | 55 | 50 | 46 | 44 |    |    |
| 7   | 70  | 57  | 50  | 44  | 68  | 56  | 49  | 44  | 54  | 48  | 43  | 52  | 47  | 42  | 51 | 46 | 42 | 40 |    |    |
| 8   | 65  | 53  | 45  | 40  | 63  | 52  | 45  | 40  | 50  | 44  | 39  | 48  | 43  | 38  | 47 | 42 | 38 | 36 |    |    |
| 9   | 61  | 49  | 41  | 36  | 59  | 48  | 41  | 36  | 46  | 40  | 36  | 45  | 39  | 35  | 44 | 38 | 35 | 33 |    |    |
| 10  | 57  | 45  | 38  | 33  | 56  | 45  | 38  | 33  | 43  | 37  | 33  | 42  | 36  | 32  | 41 | 35 | 32 | 30 |    |    |

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

|     | 0°    | 45°   | 90°   |
|-----|-------|-------|-------|
| 0°  | 8431  | 8431  | 8431  |
| 5°  | 8475  | 10605 | 12360 |
| 10° | 8550  | 14620 | 16054 |
| 15° | 8754  | 15927 | 14735 |
| 20° | 9116  | 14778 | 13168 |
| 25° | 9781  | 13290 | 12045 |
| 30° | 10906 | 11967 | 10711 |
| 35° | 12821 | 10474 | 8535  |
| 40° | 15416 | 7977  | 6793  |
| 45° | 17684 | 5434  | 4835  |
| 50° | 17928 | 3728  | 3576  |
| 55° | 15518 | 2934  | 2921  |
| 60° | 11592 | 2745  | 2628  |
| 65° | 7946  | 2754  | 2490  |
| 70° | 5080  | 2656  | 2411  |
| 75° | 3055  | 2458  | 2307  |
| 80° | 1797  | 2161  | 2380  |
| 85° | 865   | 1855  | 2207  |



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**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 644.5   | 3.8       |
| 10°-20°   | 2274.7  | 13.4      |
| 20°-30°   | 3351.8  | 19.8      |
| 30°-40°   | 3522.3  | 20.8      |
| 40°-50°   | 2695.2  | 15.9      |
| 50°-60°   | 1627.4  | 9.6       |
| 60°-70°   | 993.1   | 5.9       |
| 70°-80°   | 542.1   | 3.2       |
| 80°-90°   | 193.0   | 1.1       |
| 90°-100°  | 103.4   | 0.6       |
| 100°-110° | 359.9   | 2.1       |
| 110°-120° | 309.1   | 1.8       |
| 120°-130° | 148.1   | 0.9       |
| 130°-140° | 74.1    | 0.4       |
| 140°-150° | 43.1    | 0.3       |
| 150°-160° | 25.2    | 0.1       |
| 160°-170° | 13.1    | 0.1       |
| 170°-180° | 4.0     | 0.0       |
| 0°-30°    | 6271.0  | 37.1      |
| 0°-40°    | 9793.2  | 57.9      |
| 0°-60°    | 14115.8 | 83.4      |
| 0°-90°    | 15844.0 | 93.6      |
| 90°-120°  | 772.4   | 4.6       |
| 90°-150°  | 1037.8  | 6.1       |
| 90°-180°  | 1080.0  | 6.4       |
| 0°-180°   | 16924.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|------|------|-------|------|-------|------|------|
| 0°   | 4936 | 4936  | 4936 | 4936  | 4936 |      |
| 5°   | 4986 | 5349  | 6240 | 6968  | 7237 | 477  |
| 15°  | 5083 | 7917  | 9253 | 8634  | 8432 | 1445 |
| 25°  | 5432 | 9189  | 7387 | 6688  | 6523 | 2539 |
| 35°  | 6580 | 7358  | 5382 | 4482  | 4220 | 4174 |
| 45°  | 8053 | 4199  | 2479 | 2181  | 2090 | 6085 |
| 55°  | 5956 | 1424  | 1128 | 1046  | 1043 | 5263 |
| 65°  | 2388 | 901   | 830  | 710   | 674  | 2446 |
| 75°  | 636  | 560   | 514  | 424   | 407  | 731  |
| 85°  | 95   | 174   | 205  | 187   | 169  | 117  |
| 90°  | 3    | 16    | 21   | 27    | 30   | 7    |
| 95°  | 22   | 50    | 75   | 101   | 116  | 71   |
| 105° | 450  | 444   | 379  | 269   | 247  | 425  |
| 115° | 313  | 313   | 314  | 311   | 306  | 313  |
| 125° | 153  | 159   | 163  | 161   | 162  | 143  |
| 135° | 89   | 91    | 95   | 96    | 96   | 71   |
| 145° | 65   | 67    | 68   | 69    | 70   | 41   |
| 155° | 52   | 53    | 54   | 55    | 55   | 24   |
| 165° | 45   | 45    | 46   | 46    | 46   | 13   |
| 175° | 41   | 41    | 41   | 41    | 41   | 4    |
| 180° | 40   | 40    | 40   | 40    | 40   |      |



TEST NUMBER: P828591

CATALOG NUMBER: OHBL-18HE-A-UNV-L950-CD-UPL12

**CANDELA DISTRIBUTION (FULL):**

|        | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|--------|--------|--------|--------|--------|--------|
| 0°     | 4936.5 | 4936.5 | 4936.5 | 4936.5 | 4936.5 |
| 2.5°   | 4977.0 | 5027.8 | 5228.1 | 5435.9 | 5486.5 |
| 5°     | 4986.1 | 5349.3 | 6240.4 | 6967.9 | 7236.8 |
| 7.5°   | 4996.7 | 5870.3 | 7494.6 | 8385.4 | 8670.5 |
| 10°    | 5016.8 | 6529.1 | 8581.4 | 9220.9 | 9328.7 |
| 12.5°  | 5041.8 | 7227.1 | 9179.4 | 9156.1 | 9020.2 |
| 15°    | 5083.3 | 7917.3 | 9253.1 | 8634.5 | 8431.5 |
| 17.5°  | 5126.9 | 8501.4 | 8931.8 | 8066.8 | 7890.0 |
| 20°    | 5197.8 | 8934.9 | 8432.0 | 7562.2 | 7361.2 |
| 22.5°  | 5300.0 | 9173.3 | 7907.9 | 7105.7 | 6974.7 |
| 25°    | 5431.9 | 9188.7 | 7387.3 | 6688.1 | 6523.0 |
| 27.5°  | 5608.7 | 8975.6 | 6888.3 | 6278.9 | 6104.5 |
| 30°    | 5849.2 | 8567.4 | 6424.8 | 5785.5 | 5569.1 |
| 32.5°  | 6175.8 | 7980.0 | 5946.7 | 5189.7 | 4947.1 |
| 35°    | 6579.7 | 7358.5 | 5381.8 | 4481.9 | 4219.8 |
| 37.5°  | 7020.4 | 6668.4 | 4696.1 | 3855.0 | 3702.4 |
| 40°    | 7494.6 | 5957.3 | 3883.5 | 3268.5 | 3159.2 |
| 42.5°  | 7864.6 | 5184.2 | 3128.5 | 2716.1 | 2600.0 |
| 45°    | 8053.2 | 4198.8 | 2479.0 | 2181.4 | 2089.8 |
| 47.5°  | 7979.8 | 3259.4 | 1965.3 | 1733.3 | 1705.8 |
| 50°    | 7551.1 | 2406.7 | 1573.3 | 1427.8 | 1416.4 |
| 52.5°  | 6881.0 | 1793.8 | 1299.6 | 1209.6 | 1189.9 |
| 55°    | 5955.6 | 1423.8 | 1128.5 | 1045.9 | 1042.8 |
| 57.5°  | 5000.3 | 1209.6 | 1024.4 | 960.4  | 938.2  |
| 60°    | 3981.2 | 1078.5 | 945.4  | 873.2  | 828.1  |
| 62.5°  | 3120.7 | 986.9  | 887.4  | 789.4  | 747.3  |
| 65°    | 2387.7 | 901.4  | 830.2  | 710.4  | 674.3  |
| 67.5°  | 1779.8 | 819.9  | 760.4  | 627.5  | 606.3  |
| 70°    | 1296.8 | 736.2  | 680.8  | 558.0  | 541.3  |
| 72.5°  | 924.2  | 652.9  | 601.2  | 492.8  | 474.4  |
| 75°    | 635.7  | 560.5  | 514.2  | 424.2  | 407.1  |
| 77.5°  | 428.9  | 466.4  | 428.5  | 362.2  | 355.0  |
| 80°    | 286.4  | 369.9  | 346.6  | 306.9  | 302.5  |
| 82.5°  | 173.8  | 268.4  | 273.5  | 249.6  | 237.5  |
| 85°    | 94.6   | 173.8  | 204.9  | 186.7  | 169.4  |
| 87.5°  | 37.0   | 96.3   | 141.2  | 126.8  | 119.4  |
| 90°    | 2.6    | 15.6   | 20.9   | 27.0   | 30.4   |
| 92.5°  | 7.8    | 20.0   | 33.0   | 47.0   | 51.3   |
| 95°    | 21.7   | 50.4   | 74.8   | 100.9  | 116.5  |
| 97.5°  | 117.4  | 127.8  | 144.3  | 170.4  | 179.1  |
| 100°   | 240.0  | 258.2  | 214.8  | 224.3  | 228.7  |
| 102.5° | 381.7  | 376.5  | 274.7  | 248.7  | 244.3  |
| 105°   | 449.5  | 444.3  | 379.1  | 268.7  | 246.9  |



TEST NUMBER: P828591

CATALOG NUMBER: OHBL-18HE-A-UNV-L950-CD-UPL12

**CANDELA DISTRIBUTION (continued):**

|        | 0°    | 22.5° | 45°   | 67.5° | 90°   |
|--------|-------|-------|-------|-------|-------|
| 112.5° | 363.4 | 366.0 | 363.4 | 349.5 | 334.7 |
| 115°   | 313.0 | 313.0 | 313.9 | 311.3 | 306.0 |
| 117.5° | 262.6 | 266.0 | 268.7 | 266.0 | 264.3 |
| 120°   | 220.0 | 225.2 | 226.9 | 223.4 | 223.4 |
| 122.5° | 185.2 | 189.5 | 192.1 | 189.5 | 190.4 |
| 125°   | 153.0 | 159.1 | 162.6 | 160.8 | 161.7 |
| 127.5° | 127.8 | 133.0 | 139.1 | 138.2 | 138.2 |
| 130°   | 111.3 | 114.8 | 119.1 | 120.0 | 120.0 |
| 132.5° | 99.1  | 101.7 | 105.2 | 106.1 | 106.9 |
| 135°   | 88.7  | 91.3  | 94.8  | 95.6  | 95.6  |
| 137.5° | 81.7  | 83.5  | 86.1  | 86.9  | 87.8  |
| 140°   | 74.8  | 77.4  | 79.1  | 80.0  | 80.0  |
| 142.5° | 69.6  | 71.3  | 73.0  | 73.9  | 74.8  |
| 145°   | 65.2  | 66.9  | 67.8  | 68.7  | 69.6  |
| 147.5° | 60.9  | 62.6  | 64.3  | 64.3  | 65.2  |
| 150°   | 58.3  | 59.1  | 60.0  | 60.9  | 60.9  |
| 152.5° | 54.8  | 55.6  | 56.5  | 57.4  | 57.4  |
| 155°   | 52.2  | 53.0  | 53.9  | 54.8  | 54.8  |
| 157.5° | 49.6  | 51.3  | 51.3  | 52.2  | 52.2  |
| 160°   | 47.8  | 48.7  | 49.6  | 49.6  | 49.6  |
| 162.5° | 46.1  | 47.0  | 47.0  | 47.8  | 47.8  |
| 165°   | 45.2  | 45.2  | 46.1  | 46.1  | 46.1  |
| 167.5° | 43.5  | 43.5  | 44.3  | 44.3  | 44.3  |
| 170°   | 42.6  | 42.6  | 42.6  | 43.5  | 43.5  |
| 172.5° | 41.7  | 41.7  | 41.7  | 41.7  | 41.7  |
| 175°   | 40.9  | 40.9  | 40.9  | 40.9  | 40.9  |
| 177.5° | 40.0  | 40.9  | 40.9  | 40.9  | 40.9  |
| 180°   | 40.0  | 40.0  | 40.0  | 40.0  | 40.0  |



Report Generated By 670246072 / DESKTOP-50001EG





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







|        |       |       |       |       |       |
|--------|-------|-------|-------|-------|-------|
| 107.5° | 452.1 | 453.8 | 418.2 | 324.3 | 268.7 |
| 110°   | 413.9 | 419.9 | 400.8 | 365.2 | 320.8 |



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

Report Prepared for

Cooper Lighting Solutions

METALUX

Report Number: SP1-2307-100-9

Test Date: 08/01/2023

Luminaire Tested: OHB-15SE-N-UNV-L950-CD

Data in this report applies to families of products including OHB-15SE-N-UNV-L950-CD.

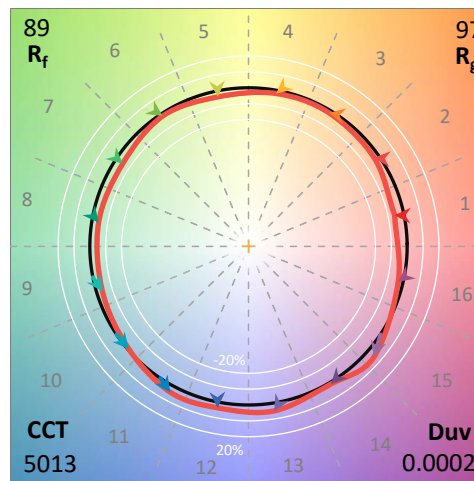
### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2307-100-9  
 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-L950-CD**  
 Description: 15000 LUMEN OHB SE LED LUMINAIRE WITH 90CRI, 5000K LEDS AND NARROW LENS

LENS

### Spectral Parameters

|                           |        |           |      |      |      |
|---------------------------|--------|-----------|------|------|------|
| CCT (K):                  | 5013   | CRI (Ra): | 92.0 |      |      |
| CIE u':                   | 0.2111 | R1:       | 92.6 | R9:  | 62.7 |
| CIE v':                   | 0.4847 | R2:       | 96.7 | R10: | 90.0 |
| Duv:                      | 0.0002 | R3:       | 96.5 | R11: | 89.8 |
| CIE x:                    | 0.3447 | R4:       | 90.1 | R12: | 69.9 |
| CIE y:                    | 0.3517 | R5:       | 91.1 | R13: | 94.5 |
| CIE z:                    | 0.3036 | R6:       | 92.0 | R14: | 98.3 |
| Peak Wavelength (nm):     | 455    | R7:       | 92.4 |      |      |
| Dominant Wavelength (nm): | 572    | R8:       | 84.9 |      |      |
| Purity:                   | 9.1    |           |      |      |      |
| Rf:                       | 88.9   |           |      |      |      |
| Rg:                       | 97.2   |           |      |      |      |



### Test Conditions

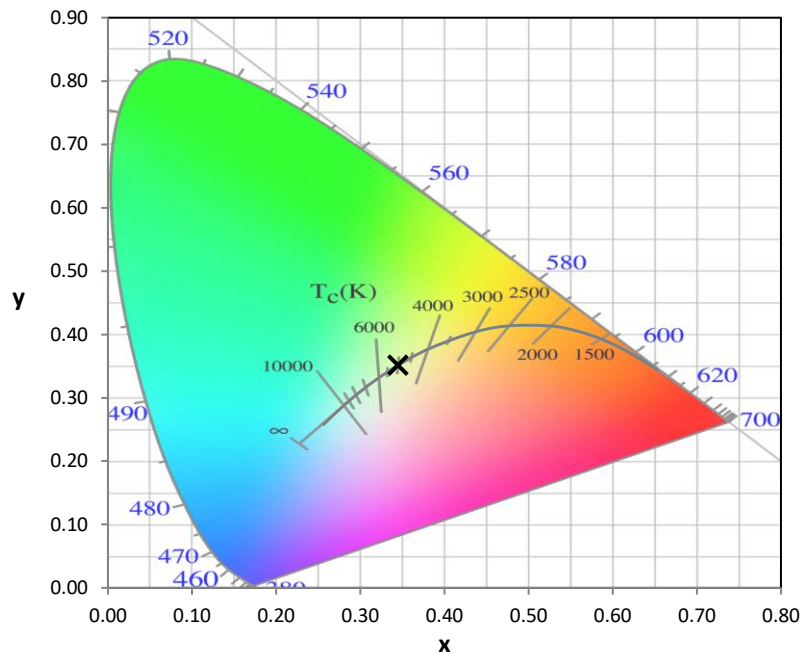
Stabilization Time: 26M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 25.7/57%  
 Sphere Temperature (°C): 25.2

REPORT NUMBER: SP1-2307-100-9

| 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           |

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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 5000K 4-step quadrangle

REPORT NUMBER: SP1-2307-100-9

**Photopic Flux vs. Wavelength**

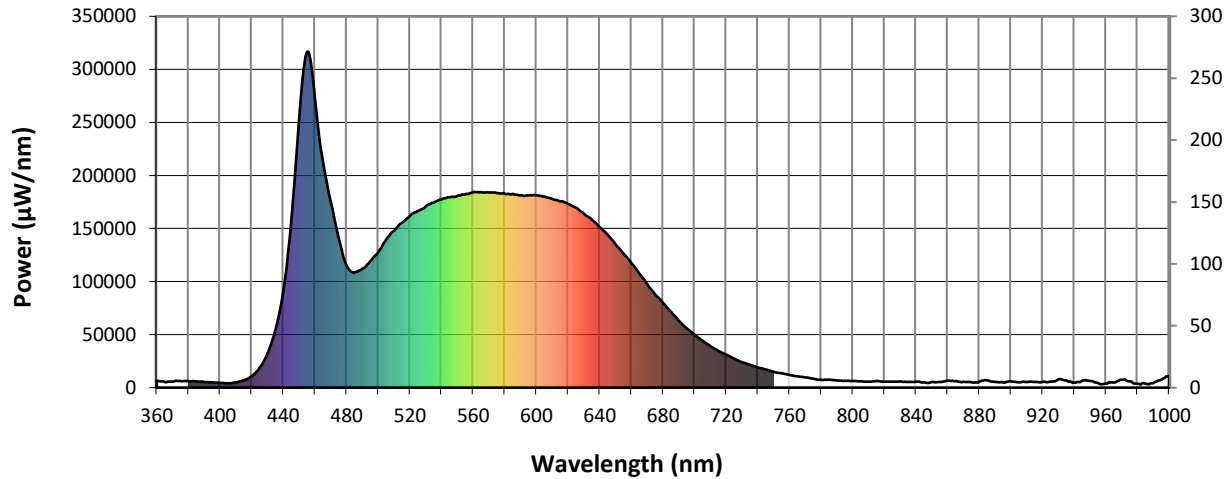


#####

| 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       | 6694             | NR               | 490       | 112019           | NR               | 620       | 173132           | NR               | 750       | 14981            | NR               | 880       | 5536             | NR               |
| 365       | 5354             | NR               | 495       | 119136           | NR               | 625       | 169860           | NR               | 755       | 13480            | NR               | 885       | 6938             | NR               |
| 370       | 5722             | NR               | 500       | 127627           | NR               | 630       | 163982           | NR               | 760       | 11900            | NR               | 890       | 5411             | NR               |
| 375       | 6251             | NR               | 505       | 139687           | NR               | 635       | 158304           | NR               | 765       | 10671            | NR               | 895       | 4784             | NR               |
| 380       | 6177             | NR               | 510       | 148127           | NR               | 640       | 151433           | NR               | 770       | 9643             | NR               | 900       | 5872             | NR               |
| 385       | 5889             | NR               | 515       | 155327           | NR               | 645       | 144044           | NR               | 775       | 8310             | NR               | 905       | 5214             | NR               |
| 390       | 5252             | NR               | 520       | 161724           | NR               | 650       | 134971           | NR               | 780       | 7378             | NR               | 910       | 5425             | NR               |
| 395       | 5012             | NR               | 525       | 166350           | NR               | 655       | 126523           | NR               | 785       | 7348             | NR               | 915       | 5372             | NR               |
| 400       | 4505             | NR               | 530       | 170827           | NR               | 660       | 117624           | NR               | 790       | 6731             | NR               | 920       | 5263             | NR               |
| 405       | 4163             | NR               | 535       | 174287           | NR               | 665       | 107737           | NR               | 795       | 6603             | NR               | 925       | 5581             | NR               |
| 410       | 4931             | NR               | 540       | 177402           | NR               | 670       | 97796            | NR               | 800       | 6333             | NR               | 930       | 7934             | NR               |
| 415       | 6887             | NR               | 545       | 179468           | NR               | 675       | 88146            | NR               | 805       | 5919             | NR               | 935       | 6835             | NR               |
| 420       | 10750            | NR               | 550       | 180621           | NR               | 680       | 80008            | NR               | 810       | 5757             | NR               | 940       | 4871             | NR               |
| 425       | 18574            | NR               | 555       | 182239           | NR               | 685       | 71588            | NR               | 815       | 6226             | NR               | 945       | 6554             | NR               |
| 430       | 31943            | NR               | 560       | 184077           | NR               | 690       | 63388            | NR               | 820       | 5694             | NR               | 950       | 6239             | NR               |
| 435       | 54504            | NR               | 565       | 184113           | NR               | 695       | 56106            | NR               | 825       | 5621             | NR               | 955       | 4562             | NR               |
| 440       | 91570            | NR               | 570       | 183843           | NR               | 700       | 49976            | NR               | 830       | 5832             | NR               | 960       | 3863             | NR               |
| 445       | 155007           | NR               | 575       | 183242           | NR               | 705       | 44326            | NR               | 835       | 5478             | NR               | 965       | 4898             | NR               |
| 450       | 253466           | NR               | 580       | 182759           | NR               | 710       | 39116            | NR               | 840       | 5675             | NR               | 970       | 7576             | NR               |
| 455       | 316705           | NR               | 585       | 182781           | NR               | 715       | 34755            | NR               | 845       | 4960             | NR               | 975       | 6056             | NR               |
| 460       | 273954           | NR               | 590       | 181075           | NR               | 720       | 30900            | NR               | 850       | 5274             | NR               | 980       | 3439             | NR               |
| 465       | 214019           | NR               | 595       | 181315           | NR               | 725       | 27349            | NR               | 855       | 5470             | NR               | 985       | 3623             | NR               |
| 470       | 175153           | NR               | 600       | 181289           | NR               | 730       | 23954            | NR               | 860       | 6539             | NR               | 990       | 4301             | NR               |
| 475       | 140894           | NR               | 605       | 180053           | NR               | 735       | 21526            | NR               | 865       | 6378             | NR               | 995       | 7368             | NR               |
| 480       | 115223           | NR               | 610       | 177907           | NR               | 740       | 18965            | NR               | 870       | 5702             | NR               | 1000      | 10668            | NR               |
| 485       | 108577           | NR               | 615       | 175575           | NR               | 745       | 17153            | NR               | 875       | 4933             | NR               |           |                  |                  |

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Scotopic Flux vs. Wavelength



Scotopic Lumens: 26039.5

S/P: 2.08

| 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       | 6694             | NR               | 490       | 112019           | NR               | 620       | 173132           | NR               | 750       | 14981            | NR               | 880       | 5536             | NR               |
| 365       | 5354             | NR               | 495       | 119136           | NR               | 625       | 169860           | NR               | 755       | 13480            | NR               | 885       | 6938             | NR               |
| 370       | 5722             | NR               | 500       | 127627           | NR               | 630       | 163982           | NR               | 760       | 11900            | NR               | 890       | 5411             | NR               |
| 375       | 6251             | NR               | 505       | 139687           | NR               | 635       | 158304           | NR               | 765       | 10671            | NR               | 895       | 4784             | NR               |
| 380       | 6177             | NR               | 510       | 148127           | NR               | 640       | 151433           | NR               | 770       | 9643             | NR               | 900       | 5872             | NR               |
| 385       | 5889             | NR               | 515       | 155327           | NR               | 645       | 144044           | NR               | 775       | 8310             | NR               | 905       | 5214             | NR               |
| 390       | 5252             | NR               | 520       | 161724           | NR               | 650       | 134971           | NR               | 780       | 7378             | NR               | 910       | 5425             | NR               |
| 395       | 5012             | NR               | 525       | 166350           | NR               | 655       | 126523           | NR               | 785       | 7348             | NR               | 915       | 5372             | NR               |
| 400       | 4505             | NR               | 530       | 170827           | NR               | 660       | 117624           | NR               | 790       | 6731             | NR               | 920       | 5263             | NR               |
| 405       | 4163             | NR               | 535       | 174287           | NR               | 665       | 107737           | NR               | 795       | 6603             | NR               | 925       | 5581             | NR               |
| 410       | 4931             | NR               | 540       | 177402           | NR               | 670       | 97796            | NR               | 800       | 6333             | NR               | 930       | 7934             | NR               |
| 415       | 6887             | NR               | 545       | 179468           | NR               | 675       | 88146            | NR               | 805       | 5919             | NR               | 935       | 6835             | NR               |
| 420       | 10750            | NR               | 550       | 180621           | NR               | 680       | 80008            | NR               | 810       | 5757             | NR               | 940       | 4871             | NR               |
| 425       | 18574            | NR               | 555       | 182239           | NR               | 685       | 71588            | NR               | 815       | 6226             | NR               | 945       | 6554             | NR               |
| 430       | 31943            | NR               | 560       | 184077           | NR               | 690       | 63388            | NR               | 820       | 5694             | NR               | 950       | 6239             | NR               |
| 435       | 54504            | NR               | 565       | 184113           | NR               | 695       | 56106            | NR               | 825       | 5621             | NR               | 955       | 4562             | NR               |
| 440       | 91570            | NR               | 570       | 183843           | NR               | 700       | 49976            | NR               | 830       | 5832             | NR               | 960       | 3863             | NR               |
| 445       | 155007           | NR               | 575       | 183242           | NR               | 705       | 44326            | NR               | 835       | 5478             | NR               | 965       | 4898             | NR               |
| 450       | 253466           | NR               | 580       | 182759           | NR               | 710       | 39116            | NR               | 840       | 5675             | NR               | 970       | 7576             | NR               |
| 455       | 316705           | NR               | 585       | 182781           | NR               | 715       | 34755            | NR               | 845       | 4960             | NR               | 975       | 6056             | NR               |
| 460       | 273954           | NR               | 590       | 181075           | NR               | 720       | 30900            | NR               | 850       | 5274             | NR               | 980       | 3439             | NR               |
| 465       | 214019           | NR               | 595       | 181315           | NR               | 725       | 27349            | NR               | 855       | 5470             | NR               | 985       | 3623             | NR               |
| 470       | 175153           | NR               | 600       | 181289           | NR               | 730       | 23954            | NR               | 860       | 6539             | NR               | 990       | 4301             | NR               |
| 475       | 140894           | NR               | 605       | 180053           | NR               | 735       | 21526            | NR               | 865       | 6378             | NR               | 995       | 7368             | NR               |
| 480       | 115223           | NR               | 610       | 177907           | NR               | 740       | 18965            | NR               | 870       | 5702             | NR               | 1000      | 10668            | NR               |
| 485       | 108577           | NR               | 615       | 175575           | NR               | 745       | 17153            | NR               | 875       | 4933             | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 11248.3 M/P: 0.9**

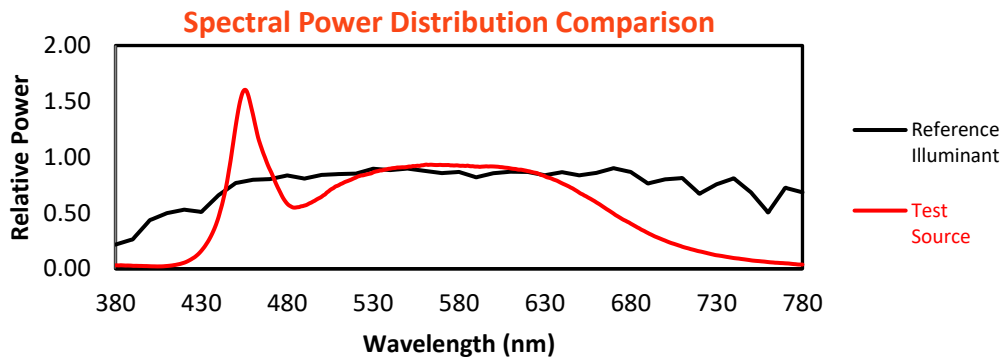
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 6694             | NR               | 490       | 112019           | NR               | 620       | 173132           | NR               | 750       | 14981            | NR               | 880       | 5536             | NR               |
| 365       | 5354             | NR               | 495       | 119136           | NR               | 625       | 169860           | NR               | 755       | 13480            | NR               | 885       | 6938             | NR               |
| 370       | 5722             | NR               | 500       | 127627           | NR               | 630       | 163982           | NR               | 760       | 11900            | NR               | 890       | 5411             | NR               |
| 375       | 6251             | NR               | 505       | 139687           | NR               | 635       | 158304           | NR               | 765       | 10671            | NR               | 895       | 4784             | NR               |
| 380       | 6177             | NR               | 510       | 148127           | NR               | 640       | 151433           | NR               | 770       | 9643             | NR               | 900       | 5872             | NR               |
| 385       | 5889             | NR               | 515       | 155327           | NR               | 645       | 144044           | NR               | 775       | 8310             | NR               | 905       | 5214             | NR               |
| 390       | 5252             | NR               | 520       | 161724           | NR               | 650       | 134971           | NR               | 780       | 7378             | NR               | 910       | 5425             | NR               |
| 395       | 5012             | NR               | 525       | 166350           | NR               | 655       | 126523           | NR               | 785       | 7348             | NR               | 915       | 5372             | NR               |
| 400       | 4505             | NR               | 530       | 170827           | NR               | 660       | 117624           | NR               | 790       | 6731             | NR               | 920       | 5263             | NR               |
| 405       | 4163             | NR               | 535       | 174287           | NR               | 665       | 107737           | NR               | 795       | 6603             | NR               | 925       | 5581             | NR               |
| 410       | 4931             | NR               | 540       | 177402           | NR               | 670       | 97796            | NR               | 800       | 6333             | NR               | 930       | 7934             | NR               |
| 415       | 6887             | NR               | 545       | 179468           | NR               | 675       | 88146            | NR               | 805       | 5919             | NR               | 935       | 6835             | NR               |
| 420       | 10750            | NR               | 550       | 180621           | NR               | 680       | 80008            | NR               | 810       | 5757             | NR               | 940       | 4871             | NR               |
| 425       | 18574            | NR               | 555       | 182239           | NR               | 685       | 71588            | NR               | 815       | 6226             | NR               | 945       | 6554             | NR               |
| 430       | 31943            | NR               | 560       | 184077           | NR               | 690       | 63388            | NR               | 820       | 5694             | NR               | 950       | 6239             | NR               |
| 435       | 54504            | NR               | 565       | 184113           | NR               | 695       | 56106            | NR               | 825       | 5621             | NR               | 955       | 4562             | NR               |
| 440       | 91570            | NR               | 570       | 183843           | NR               | 700       | 49976            | NR               | 830       | 5832             | NR               | 960       | 3863             | NR               |
| 445       | 155007           | NR               | 575       | 183242           | NR               | 705       | 44326            | NR               | 835       | 5478             | NR               | 965       | 4898             | NR               |
| 450       | 253466           | NR               | 580       | 182759           | NR               | 710       | 39116            | NR               | 840       | 5675             | NR               | 970       | 7576             | NR               |
| 455       | 316705           | NR               | 585       | 182781           | NR               | 715       | 34755            | NR               | 845       | 4960             | NR               | 975       | 6056             | NR               |
| 460       | 273954           | NR               | 590       | 181075           | NR               | 720       | 30900            | NR               | 850       | 5274             | NR               | 980       | 3439             | NR               |
| 465       | 214019           | NR               | 595       | 181315           | NR               | 725       | 27349            | NR               | 855       | 5470             | NR               | 985       | 3623             | NR               |
| 470       | 175153           | NR               | 600       | 181289           | NR               | 730       | 23954            | NR               | 860       | 6539             | NR               | 990       | 4301             | NR               |
| 475       | 140894           | NR               | 605       | 180053           | NR               | 735       | 21526            | NR               | 865       | 6378             | NR               | 995       | 7368             | NR               |
| 480       | 115223           | NR               | 610       | 177907           | NR               | 740       | 18965            | NR               | 870       | 5702             | NR               | 1000      | 10668            | NR               |
| 485       | 108577           | NR               | 615       | 175575           | NR               | 745       | 17153            | NR               | 875       | 4933             | NR               |           |                  |                  |

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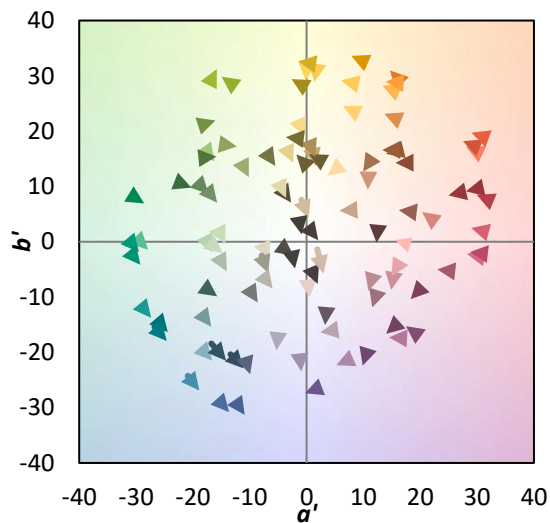
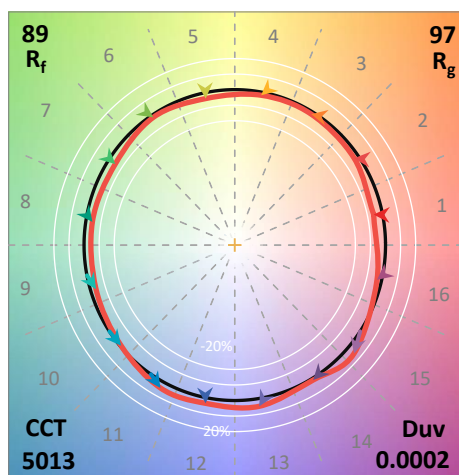
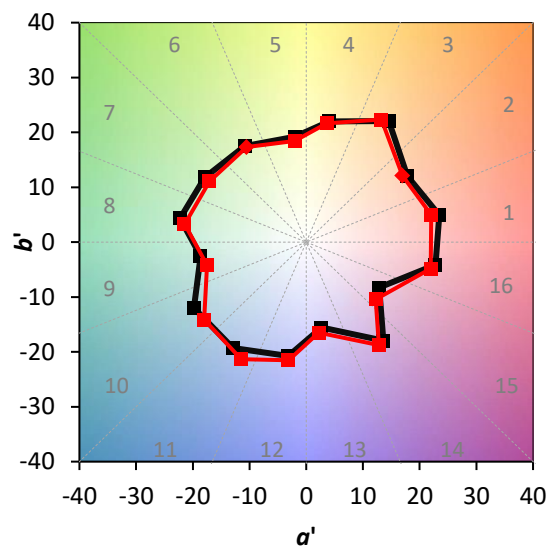
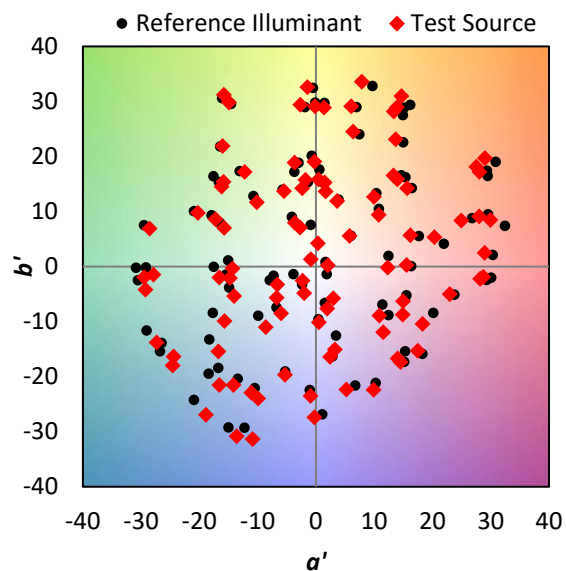
**TM-30-18**

**Summary**

$R_f = 88.9$   
 $R_g = 97.2$   
 $CIE R_a = 92.0$   
 $R_9 = 62.7$



**Color Vector Graphics**

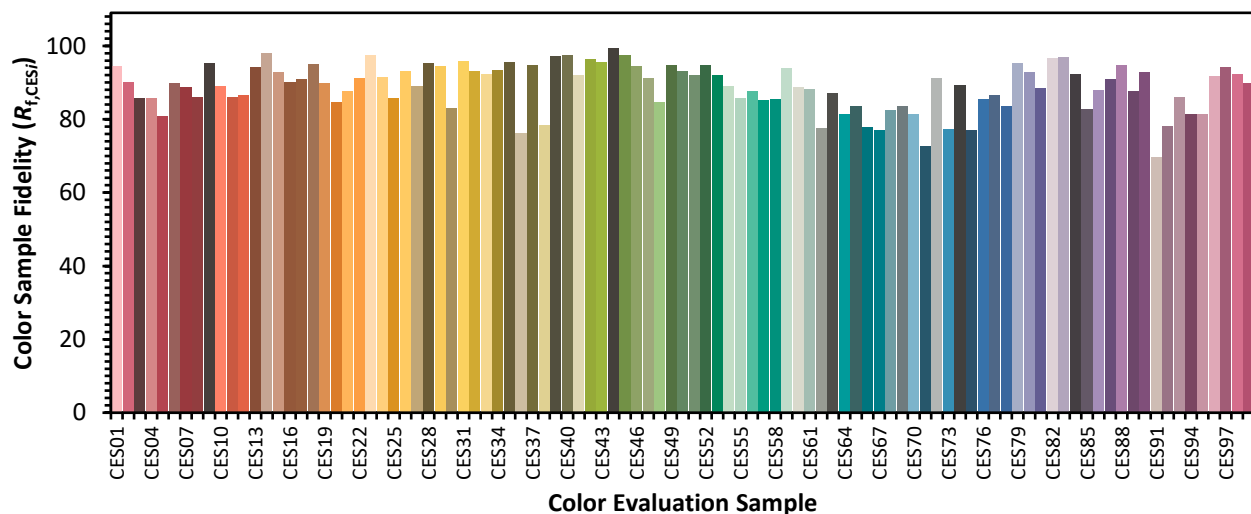


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**Individual Sample Fidelity Index ( $R_{f,i}$ )**

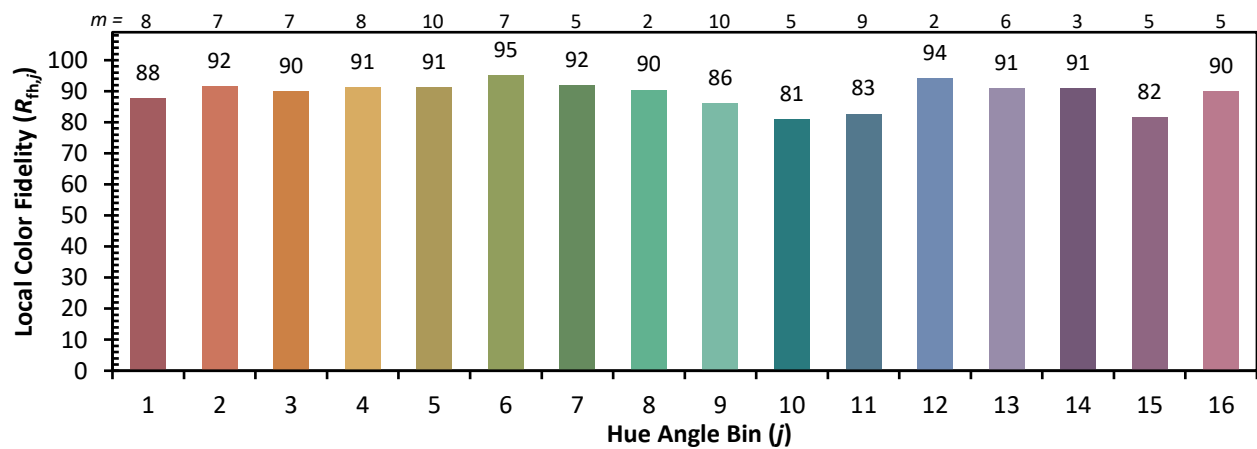
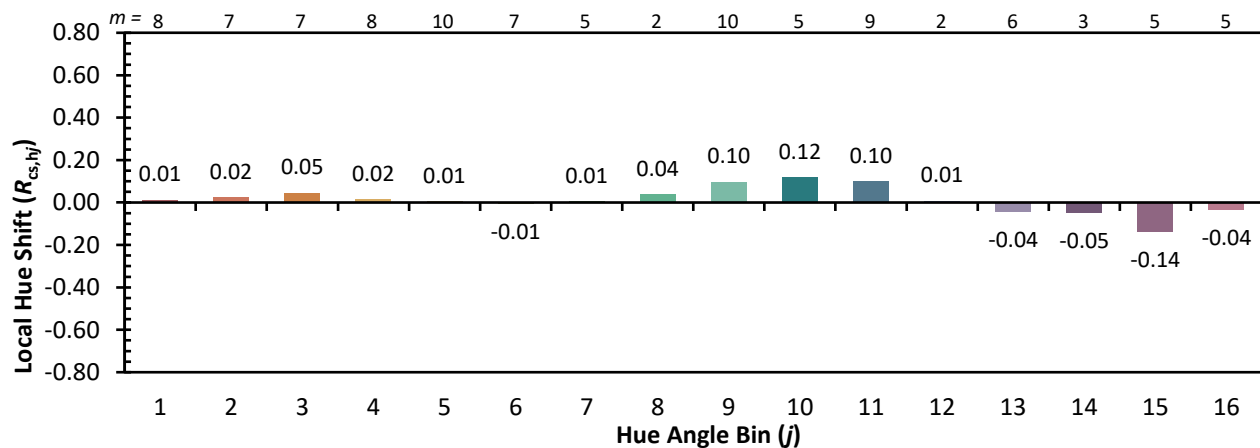
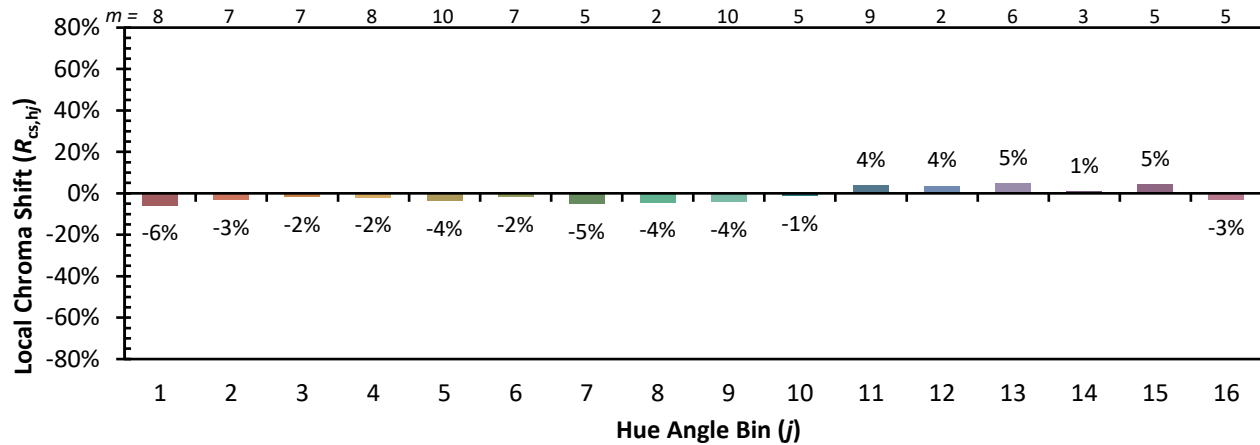
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 93 | CES51 = 92 | CES76 = 85 |
| CES02 = 61 | CES27 = 89 | CES52 = 95 | CES77 = 86 |
| CES03 = 31 | CES28 = 95 | CES53 = 92 | CES78 = 84 |
| CES04 = 69 | CES29 = 94 | CES54 = 89 | CES79 = 95 |
| CES05 = 48 | CES30 = 83 | CES55 = 86 | CES80 = 93 |
| CES06 = 50 | CES31 = 96 | CES56 = 88 | CES81 = 89 |
| CES07 = 41 | CES32 = 93 | CES57 = 85 | CES82 = 97 |
| CES08 = 40 | CES33 = 92 | CES58 = 85 | CES83 = 97 |
| CES09 = 29 | CES34 = 93 | CES59 = 94 | CES84 = 92 |
| CES10 = 73 | CES35 = 96 | CES60 = 89 | CES85 = 83 |
| CES11 = 56 | CES36 = 76 | CES61 = 88 | CES86 = 88 |
| CES12 = 62 | CES37 = 95 | CES62 = 78 | CES87 = 91 |
| CES13 = 42 | CES38 = 78 | CES63 = 87 | CES88 = 95 |
| CES14 = 74 | CES39 = 97 | CES64 = 81 | CES89 = 88 |
| CES15 = 71 | CES40 = 97 | CES65 = 84 | CES90 = 93 |
| CES16 = 46 | CES41 = 92 | CES66 = 78 | CES91 = 70 |
| CES17 = 49 | CES42 = 96 | CES67 = 77 | CES92 = 78 |
| CES18 = 56 | CES43 = 95 | CES68 = 82 | CES93 = 86 |
| CES19 = 70 | CES44 = 99 | CES69 = 84 | CES94 = 81 |
| CES20 = 65 | CES45 = 97 | CES70 = 81 | CES95 = 81 |
| CES21 = 85 | CES46 = 95 | CES71 = 73 | CES96 = 92 |
| CES22 = 77 | CES47 = 91 | CES72 = 91 | CES97 = 94 |
| CES23 = 91 | CES48 = 85 | CES73 = 77 | CES98 = 92 |
| CES24 = 90 | CES49 = 95 | CES74 = 89 | CES99 = 90 |
| CES25 = 70 | CES50 = 93 | CES75 = 77 |            |



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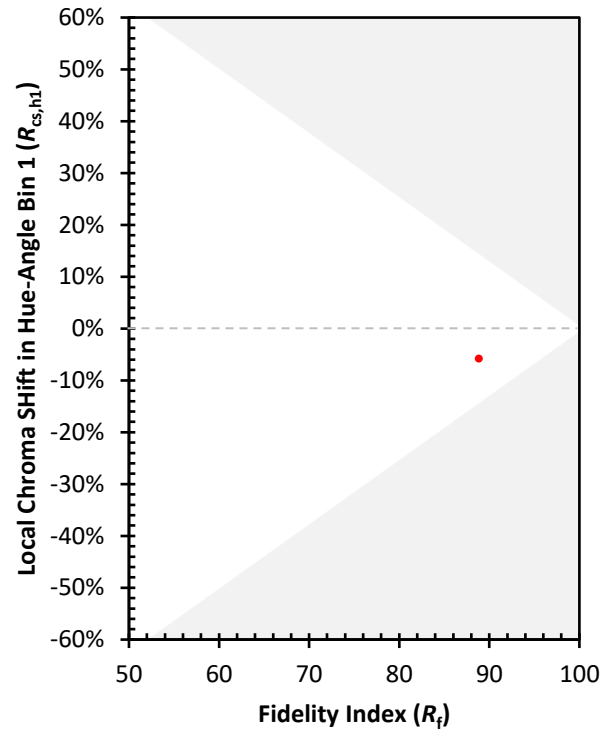
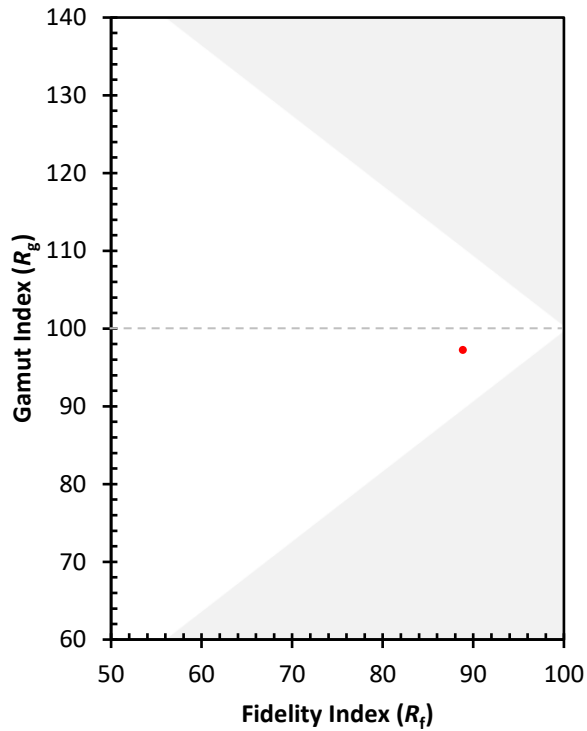
Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)