

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: P732209

Luminaire Tested: **24CZ2-40-SQR-B2750-W2D-4000K**

Issue Date: 1/5/2024



**Test Information**

Test Method: LM-79-08  
Report Number: P732209  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (P388488)  
Test Lab: INNOVATION CENTER (G2)  
Issue Date: 1/5/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: METALUX  
Catalog Number: 24CZ2-40-SQR-B2750-W2D-4000K  
Description: 2X4 4000 LUMEN CRUZE TROFFER WITH BIO UP LEDS AT 4000K CCT AND SQR LENS  
  
Light Source: -  
Ballast/Driver: -

**Summary**

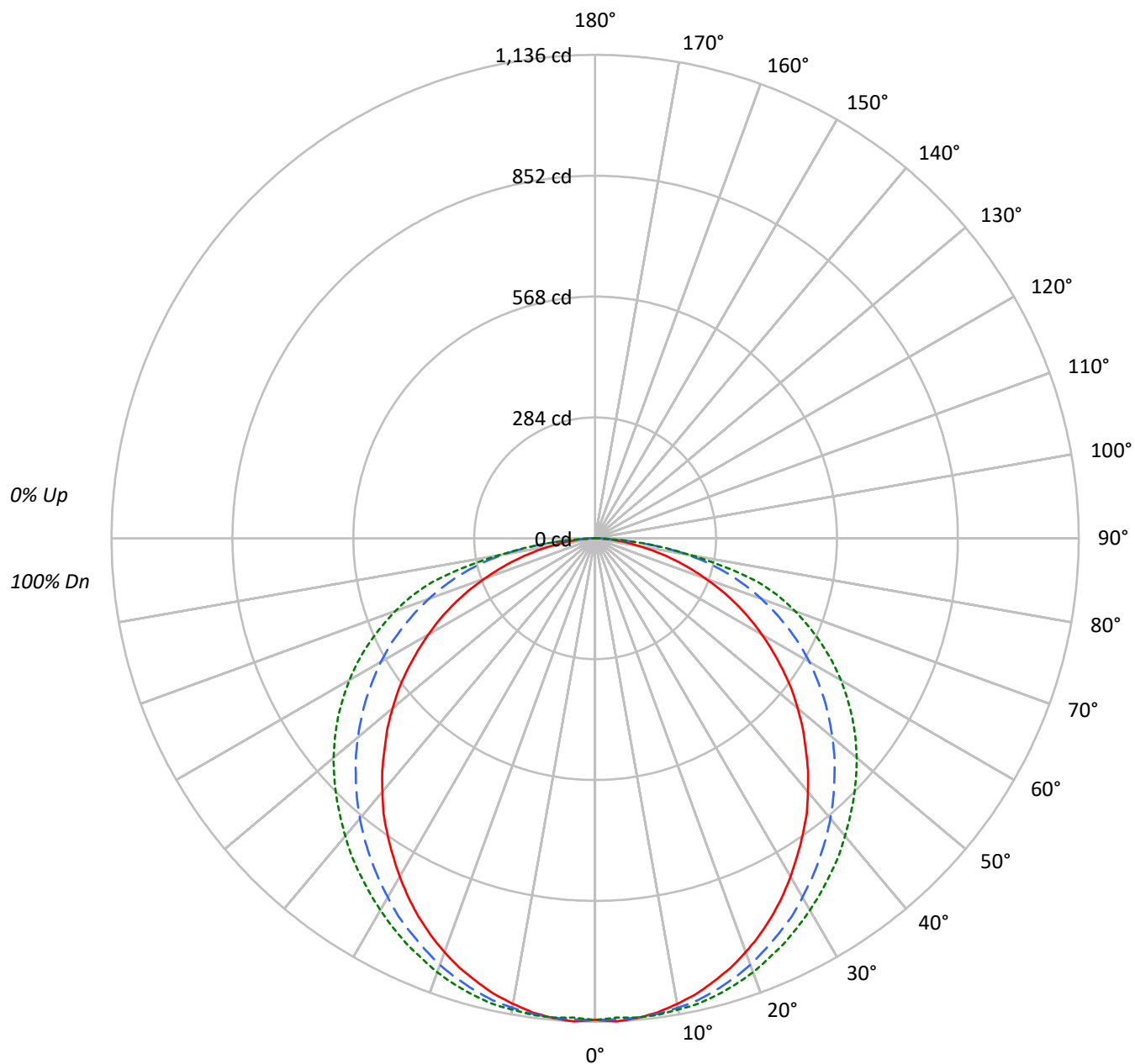
Lumens per Lamp: N/A  
Luminaire Lumens: 3541.0 lumens  
Efficiency: N/A  
Efficacy: 114.2 lumens/watt  
Spacing Criteria (0/90/45): 1.21 / 1.33 / 1.41  
Luminous Opening: Rectangular (W 1.92' x L: 3.98' x H: 0')  
CIE Type: Direct

Input Watts (W): 31  
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: P732209

CATALOG NUMBER: 24CZ2-40-SQR-B2750-W2D-4000K

### Luminous Intensity Polar Plot





TEST NUMBER: P732209

CATALOG NUMBER: 24CZ2-40-SQR-B2750-W2D-4000K

**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   | 108 | 103 | 98  | 94  | 105 | 100 | 96  | 92  | 96  | 93  | 89  | 92  | 89  | 87  | 89  | 86  | 84  | 82  |    |    |
| 2   | 98  | 89  | 81  | 75  | 95  | 87  | 80  | 74  | 83  | 78  | 73  | 80  | 75  | 71  | 77  | 73  | 69  | 67  |    |    |
| 3   | 89  | 77  | 69  | 62  | 86  | 76  | 68  | 61  | 73  | 66  | 60  | 70  | 64  | 59  | 67  | 62  | 58  | 56  |    |    |
| 4   | 81  | 68  | 59  | 52  | 78  | 67  | 58  | 52  | 64  | 57  | 51  | 62  | 55  | 50  | 60  | 54  | 49  | 47  |    |    |
| 5   | 74  | 61  | 51  | 44  | 72  | 60  | 51  | 44  | 57  | 50  | 44  | 55  | 49  | 43  | 54  | 48  | 43  | 41  |    |    |
| 6   | 68  | 55  | 45  | 39  | 66  | 54  | 45  | 38  | 52  | 44  | 38  | 50  | 43  | 38  | 48  | 42  | 37  | 35  |    |    |
| 7   | 63  | 49  | 40  | 34  | 62  | 49  | 40  | 34  | 47  | 39  | 34  | 45  | 39  | 33  | 44  | 38  | 33  | 31  |    |    |
| 8   | 59  | 45  | 36  | 30  | 57  | 44  | 36  | 30  | 43  | 35  | 30  | 42  | 35  | 30  | 40  | 34  | 30  | 28  |    |    |
| 9   | 55  | 41  | 33  | 27  | 54  | 41  | 33  | 27  | 39  | 32  | 27  | 38  | 32  | 27  | 37  | 31  | 27  | 25  |    |    |
| 10  | 52  | 38  | 30  | 25  | 50  | 37  | 30  | 24  | 36  | 29  | 24  | 36  | 29  | 24  | 35  | 29  | 24  | 22  |    |    |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 1597 | 1597 | 1597 |
| 5°  | 1603 | 1602 | 1602 |
| 10° | 1592 | 1606 | 1612 |
| 15° | 1575 | 1606 | 1623 |
| 20° | 1554 | 1602 | 1630 |
| 25° | 1528 | 1593 | 1635 |
| 30° | 1496 | 1587 | 1645 |
| 35° | 1465 | 1584 | 1660 |
| 40° | 1433 | 1584 | 1683 |
| 45° | 1396 | 1587 | 1716 |
| 50° | 1363 | 1597 | 1761 |
| 55° | 1324 | 1614 | 1815 |
| 60° | 1277 | 1640 | 1881 |
| 65° | 1222 | 1671 | 1960 |
| 70° | 1134 | 1713 | 2060 |
| 75° | 1027 | 1772 | 2156 |
| 80° | 865  | 1778 | 1852 |
| 85° | 662  | 1344 | 1344 |



TEST NUMBER: P732209

CATALOG NUMBER: 24CZ2-40-SQR-B2750-W2D-4000K

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 107.4  | 3.0       |
| 10°-20°   | 309.1  | 8.7       |
| 20°-30°   | 469.5  | 13.3      |
| 30°-40°   | 571.1  | 16.1      |
| 40°-50°   | 608.1  | 17.2      |
| 50°-60°   | 579.1  | 16.4      |
| 60°-70°   | 484.3  | 13.7      |
| 70°-80°   | 322.9  | 9.1       |
| 80°-90°   | 89.4   | 2.5       |
| 90°-100°  | 0.0    | 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°    | 886.1  | 25.0      |
| 0°-40°    | 1457.2 | 41.2      |
| 0°-60°    | 2644.5 | 74.7      |
| 0°-90°    | 3541.0 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 3541.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|-----|------|-------|------|-------|------|------|
| 0°  | 1132 | 1132  | 1132 | 1132  | 1132 |      |
| 5°  | 1132 | 1125  | 1131 | 1131  | 1131 | 107  |
| 15° | 1078 | 1080  | 1099 | 1107  | 1111 | 304  |
| 25° | 981  | 994   | 1023 | 1041  | 1050 | 452  |
| 35° | 850  | 875   | 919  | 950   | 963  | 532  |
| 45° | 699  | 737   | 795  | 840   | 860  | 541  |
| 55° | 538  | 585   | 656  | 713   | 738  | 481  |
| 65° | 366  | 420   | 500  | 562   | 587  | 362  |
| 75° | 188  | 248   | 325  | 380   | 395  | 199  |
| 85° | 41   | 76    | 83   | 82    | 83   | 49   |
| 90° | 0    | 0     | 0    | 0     | 0    |      |



TEST NUMBER: P732209

CATALOG NUMBER: 24CZ2-40-SQR-B2750-W2D-4000K

**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|-------|--------|--------|--------|--------|--------|
| 0°    | 1131.8 | 1131.8 | 1131.8 | 1131.8 | 1131.8 |
| 2.5°  | 1136.5 | 1128.3 | 1131.8 | 1131.8 | 1127.3 |
| 5°    | 1131.8 | 1124.8 | 1130.7 | 1130.7 | 1130.7 |
| 7.5°  | 1123.8 | 1117.8 | 1127.3 | 1129.5 | 1129.5 |
| 10°   | 1110.8 | 1108.6 | 1120.3 | 1123.8 | 1124.8 |
| 12.5° | 1096.9 | 1095.6 | 1112.1 | 1116.6 | 1120.3 |
| 15°   | 1078.0 | 1080.5 | 1099.1 | 1107.3 | 1110.8 |
| 17.5° | 1058.3 | 1062.8 | 1083.9 | 1095.6 | 1099.1 |
| 20°   | 1034.9 | 1041.9 | 1066.5 | 1078.0 | 1085.2 |
| 22.5° | 1009.2 | 1019.7 | 1045.3 | 1059.3 | 1067.5 |
| 25°   | 981.1  | 993.8  | 1023.2 | 1040.6 | 1050.1 |
| 27.5° | 950.7  | 967.1  | 1001.0 | 1020.7 | 1030.2 |
| 30°   | 917.9  | 936.5  | 974.1  | 997.5  | 1009.2 |
| 32.5° | 884.0  | 906.2  | 947.2  | 972.9  | 986.8  |
| 35°   | 850.1  | 874.7  | 919.1  | 949.5  | 963.4  |
| 37.5° | 816.2  | 840.7  | 889.9  | 922.6  | 940.2  |
| 40°   | 777.6  | 806.8  | 859.5  | 895.7  | 913.3  |
| 42.5° | 740.2  | 771.7  | 827.9  | 867.6  | 886.4  |
| 45°   | 699.2  | 736.7  | 795.1  | 839.6  | 859.5  |
| 47.5° | 661.8  | 699.2  | 762.4  | 809.2  | 831.4  |
| 50°   | 620.9  | 660.6  | 727.3  | 778.8  | 802.2  |
| 52.5° | 581.1  | 622.1  | 692.2  | 747.2  | 770.6  |
| 55°   | 537.9  | 584.6  | 656.0  | 713.3  | 737.8  |
| 57.5° | 494.6  | 544.9  | 618.5  | 678.2  | 702.8  |
| 60°   | 452.5  | 503.9  | 581.1  | 640.8  | 666.5  |
| 62.5° | 410.4  | 461.8  | 542.5  | 603.3  | 627.9  |
| 65°   | 365.9  | 419.7  | 500.4  | 562.4  | 587.0  |
| 67.5° | 321.6  | 377.6  | 458.3  | 520.3  | 543.7  |
| 70°   | 274.7  | 334.5  | 415.2  | 475.9  | 499.3  |
| 72.5° | 231.6  | 291.2  | 370.6  | 430.4  | 452.5  |
| 75°   | 188.3  | 247.9  | 325.0  | 380.1  | 395.3  |
| 77.5° | 146.2  | 205.8  | 274.7  | 311.1  | 314.6  |
| 80°   | 106.4  | 162.6  | 218.7  | 229.2  | 227.9  |
| 82.5° | 71.3   | 121.6  | 150.9  | 152.0  | 155.5  |
| 85°   | 40.9   | 76.0   | 83.0   | 81.9   | 83.0   |
| 87.5° | 16.4   | 26.9   | 23.4   | 17.5   | 17.5   |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



Report Generated By 670246072 / DESKTOP-50001EG







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







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

Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

METALUX

Report Number: SP1-2210-795-4

Test Date: 10/06/2022

Luminaire Tested: 9WP217084MDER4AM-4000K-315MA

Data in this report applies to families of products including 9WP217084MDER4AM-4000K.

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2210-795-4  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/06/2022  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: METALUX  
 Catalog Number: **9WP217084MDER4AM-4000K-315MA**  
 Description: METALUX

TUNABLE BOARD, 4000K-315MA, PROGRAMMED @ 5.0Vdc.

### Spectral Parameters

CCT (K): 4009  
 CIE  $u'$ : 0.2311  
 CIE  $v'$ : 0.4879  
 Duv: -0.0109  
 CIE x: 0.3728  
 CIE y: 0.3498  
 CIE z: 0.2775  
 Peak Wavelength (nm): 632  
 Dominant Wavelength (nm): 588  
 Purity: 17.1

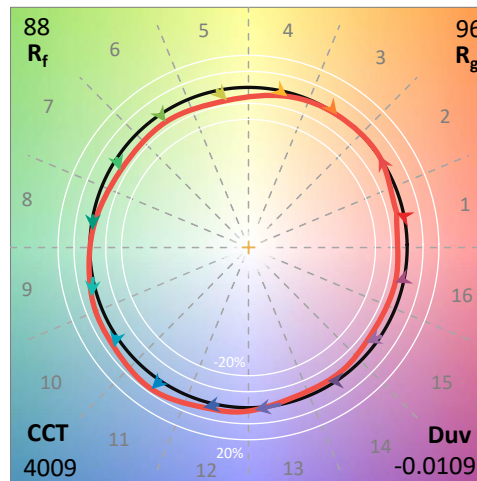
CRI (Ra): 87.8

|     |      |      |      |
|-----|------|------|------|
| R1: | 94.2 | R9:  | 79.5 |
| R2: | 88.6 | R10: | 77.2 |
| R3: | 84.5 | R11: | 92.9 |
| R4: | 91.1 | R12: | 72.5 |
| R5: | 92.1 | R13: | 92.1 |
| R6: | 82.3 | R14: | 92.6 |
| R7: | 84.3 |      |      |
| R8: | 84.9 |      |      |

Rf: 88  
 Rg: 96.2

### Test Conditions

Stabilization Time: 44M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.0/38%  
 Sphere Temperature (°C): 24.4



REPORT NUMBER: SP1-2210-795-4

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | 76INCH SPHERE IN0058  | 8/8/2022         | 2/8/2023             |
| Power Meter                    | XITRON 2801 IN0071    | 11/29/2021       | 11/29/2022           |
| AC Power Source                | CHROMA 61603 IN0063   | 11/29/2021       | 11/29/2022           |
| DC Power Source                | AGILENT E3634A IN0208 | 11/29/2021       | 11/29/2022           |
| Sphere Thermometer             | ONSET IN0085          | 11/29/2021       | 11/29/2022           |
| Room Thermometer               | ONSET IN0046          | 11/29/2021       | 11/29/2022           |

REPORT NUMBER: SP1-2210-795-4

**CIE 1931 Chromaticity Diagram**



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



Point lies outside the range



REPORT NUMBER: SP1-2210-795-4

**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       | 1347             | NR               | 490       | 31353            | NR               | 620       | 38840            | NR               | 750       | 1762             | NR               | 880       | 2493             | NR               |
| 365       | 1168             | NR               | 495       | 28718            | NR               | 625       | 37861            | NR               | 755       | 1752             | NR               | 885       | 1913             | NR               |
| 370       | 1204             | NR               | 500       | 26605            | NR               | 630       | 59547            | NR               | 760       | 1690             | NR               | 890       | 2275             | NR               |
| 375       | 1232             | NR               | 505       | 25784            | NR               | 635       | 49312            | NR               | 765       | 1395             | NR               | 895       | 2173             | NR               |
| 380       | 1249             | NR               | 510       | 25614            | NR               | 640       | 28168            | NR               | 770       | 1452             | NR               | 900       | 1923             | NR               |
| 385       | 1285             | NR               | 515       | 25941            | NR               | 645       | 27115            | NR               | 775       | 1370             | NR               | 905       | 1511             | NR               |
| 390       | 1154             | NR               | 520       | 25900            | NR               | 650       | 24916            | NR               | 780       | 1429             | NR               | 910       | 1971             | NR               |
| 395       | 1036             | NR               | 525       | 26015            | NR               | 655       | 19572            | NR               | 785       | 1112             | NR               | 915       | 1957             | NR               |
| 400       | 873              | NR               | 530       | 26424            | NR               | 660       | 16766            | NR               | 790       | 1222             | NR               | 920       | 1699             | NR               |
| 405       | 908              | NR               | 535       | 26869            | NR               | 665       | 14487            | NR               | 795       | 1347             | NR               | 925       | 2123             | NR               |
| 410       | 1056             | NR               | 540       | 27684            | NR               | 670       | 12943            | NR               | 800       | 1132             | NR               | 930       | 2029             | NR               |
| 415       | 1492             | NR               | 545       | 28407            | NR               | 675       | 11228            | NR               | 805       | 1360             | NR               | 935       | 2371             | NR               |
| 420       | 2426             | NR               | 550       | 29571            | NR               | 680       | 9665             | NR               | 810       | 1451             | NR               | 940       | 1649             | NR               |
| 425       | 4409             | NR               | 555       | 30862            | NR               | 685       | 8389             | NR               | 815       | 1507             | NR               | 945       | 1984             | NR               |
| 430       | 7984             | NR               | 560       | 32297            | NR               | 690       | 7170             | NR               | 820       | 1466             | NR               | 950       | 1495             | NR               |
| 435       | 14687            | NR               | 565       | 33979            | NR               | 695       | 6398             | NR               | 825       | 1609             | NR               | 955       | 1862             | NR               |
| 440       | 26286            | NR               | 570       | 35579            | NR               | 700       | 5544             | NR               | 830       | 1642             | NR               | 960       | 2951             | NR               |
| 445       | 36513            | NR               | 575       | 36922            | NR               | 705       | 4845             | NR               | 835       | 1363             | NR               | 965       | 3240             | NR               |
| 450       | 34274            | NR               | 580       | 38319            | NR               | 710       | 4309             | NR               | 840       | 1294             | NR               | 970       | 3119             | NR               |
| 455       | 27519            | NR               | 585       | 39771            | NR               | 715       | 3879             | NR               | 845       | 1584             | NR               | 975       | 3020             | NR               |
| 460       | 26986            | NR               | 590       | 40329            | NR               | 720       | 3504             | NR               | 850       | 1930             | NR               | 980       | 3800             | NR               |
| 465       | 32511            | NR               | 595       | 40738            | NR               | 725       | 3094             | NR               | 855       | 1952             | NR               | 985       | 3748             | NR               |
| 470       | 41588            | NR               | 600       | 40944            | NR               | 730       | 2758             | NR               | 860       | 1631             | NR               | 990       | 2878             | NR               |
| 475       | 46297            | NR               | 605       | 41826            | NR               | 735       | 2441             | NR               | 865       | 1714             | NR               | 995       | 3708             | NR               |
| 480       | 42885            | NR               | 610       | 48714            | NR               | 740       | 2221             | NR               | 870       | 1878             | NR               | 1000      | 3359             | NR               |
| 485       | 35895            | NR               | 615       | 48984            | NR               | 745       | 2091             | NR               | 875       | 2024             | NR               |           |                  |                  |

REPORT NUMBER: SP1-2210-795-4

**Scotopic Flux vs. Wavelength**



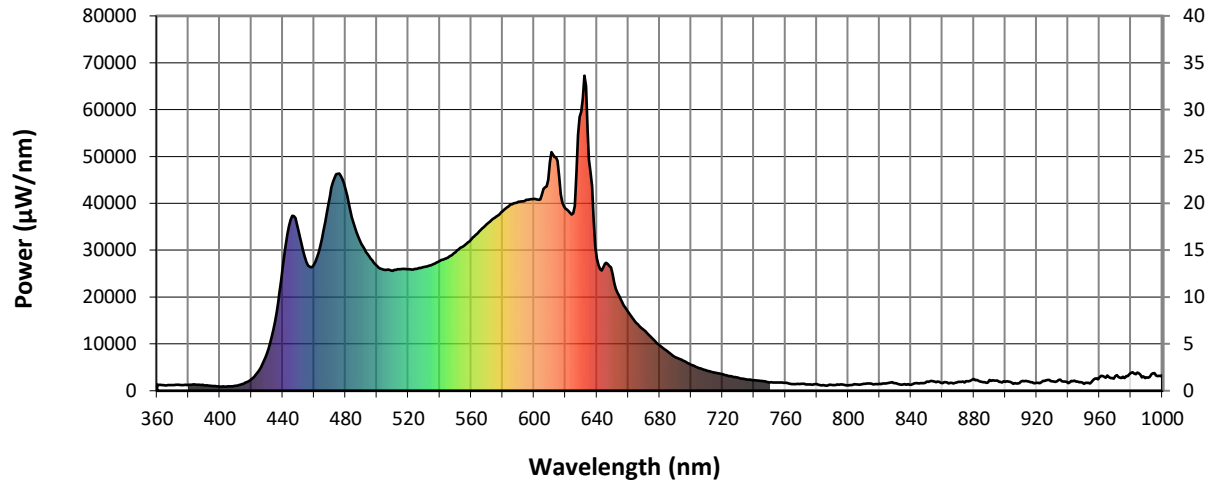
**Scotopic Lumens: 4927.4**

**S/P: 2.02**

| $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) |
|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|
| 360               | 1347                          | NR                             | 490               | 31353                         | NR                             | 620               | 38840                         | NR                             | 750               | 1762                          | NR                             | 880               | 2493                          | NR                             |
| 365               | 1168                          | NR                             | 495               | 28718                         | NR                             | 625               | 37861                         | NR                             | 755               | 1752                          | NR                             | 885               | 1913                          | NR                             |
| 370               | 1204                          | NR                             | 500               | 26605                         | NR                             | 630               | 59547                         | NR                             | 760               | 1690                          | NR                             | 890               | 2275                          | NR                             |
| 375               | 1232                          | NR                             | 505               | 25784                         | NR                             | 635               | 49312                         | NR                             | 765               | 1395                          | NR                             | 895               | 2173                          | NR                             |
| 380               | 1249                          | NR                             | 510               | 25614                         | NR                             | 640               | 28168                         | NR                             | 770               | 1452                          | NR                             | 900               | 1923                          | NR                             |
| 385               | 1285                          | NR                             | 515               | 25941                         | NR                             | 645               | 27115                         | NR                             | 775               | 1370                          | NR                             | 905               | 1511                          | NR                             |
| 390               | 1154                          | NR                             | 520               | 25900                         | NR                             | 650               | 24916                         | NR                             | 780               | 1429                          | NR                             | 910               | 1971                          | NR                             |
| 395               | 1036                          | NR                             | 525               | 26015                         | NR                             | 655               | 19572                         | NR                             | 785               | 1112                          | NR                             | 915               | 1957                          | NR                             |
| 400               | 873                           | NR                             | 530               | 26424                         | NR                             | 660               | 16766                         | NR                             | 790               | 1222                          | NR                             | 920               | 1699                          | NR                             |
| 405               | 908                           | NR                             | 535               | 26869                         | NR                             | 665               | 14487                         | NR                             | 795               | 1347                          | NR                             | 925               | 2123                          | NR                             |
| 410               | 1056                          | NR                             | 540               | 27684                         | NR                             | 670               | 12943                         | NR                             | 800               | 1132                          | NR                             | 930               | 2029                          | NR                             |
| 415               | 1492                          | NR                             | 545               | 28407                         | NR                             | 675               | 11228                         | NR                             | 805               | 1360                          | NR                             | 935               | 2371                          | NR                             |
| 420               | 2426                          | NR                             | 550               | 29571                         | NR                             | 680               | 9665                          | NR                             | 810               | 1451                          | NR                             | 940               | 1649                          | NR                             |
| 425               | 4409                          | NR                             | 555               | 30862                         | NR                             | 685               | 8389                          | NR                             | 815               | 1507                          | NR                             | 945               | 1984                          | NR                             |
| 430               | 7984                          | NR                             | 560               | 32297                         | NR                             | 690               | 7170                          | NR                             | 820               | 1466                          | NR                             | 950               | 1495                          | NR                             |
| 435               | 14687                         | NR                             | 565               | 33979                         | NR                             | 695               | 6398                          | NR                             | 825               | 1609                          | NR                             | 955               | 1862                          | NR                             |
| 440               | 26286                         | NR                             | 570               | 35579                         | NR                             | 700               | 5544                          | NR                             | 830               | 1642                          | NR                             | 960               | 2951                          | NR                             |
| 445               | 36513                         | NR                             | 575               | 36922                         | NR                             | 705               | 4845                          | NR                             | 835               | 1363                          | NR                             | 965               | 3240                          | NR                             |
| 450               | 34274                         | NR                             | 580               | 38319                         | NR                             | 710               | 4309                          | NR                             | 840               | 1294                          | NR                             | 970               | 3119                          | NR                             |
| 455               | 27519                         | NR                             | 585               | 39771                         | NR                             | 715               | 3879                          | NR                             | 845               | 1584                          | NR                             | 975               | 3020                          | NR                             |
| 460               | 26986                         | NR                             | 590               | 40329                         | NR                             | 720               | 3504                          | NR                             | 850               | 1930                          | NR                             | 980               | 3800                          | NR                             |
| 465               | 32511                         | NR                             | 595               | 40738                         | NR                             | 725               | 3094                          | NR                             | 855               | 1952                          | NR                             | 985               | 3748                          | NR                             |
| 470               | 41588                         | NR                             | 600               | 40944                         | NR                             | 730               | 2758                          | NR                             | 860               | 1631                          | NR                             | 990               | 2878                          | NR                             |
| 475               | 46297                         | NR                             | 605               | 41826                         | NR                             | 735               | 2441                          | NR                             | 865               | 1714                          | NR                             | 995               | 3708                          | NR                             |
| 480               | 42885                         | NR                             | 610               | 48714                         | NR                             | 740               | 2221                          | NR                             | 870               | 1878                          | NR                             | 1000              | 3359                          | NR                             |
| 485               | 35895                         | NR                             | 615               | 48984                         | NR                             | 745               | 2091                          | NR                             | 875               | 2024                          | NR                             |                   |                               |                                |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 2189.1**

**S/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       | 1347             | NR               | 490       | 31353            | NR               | 620       | 38840            | NR               | 750       | 1762             | NR               | 880       | 2493             | NR               |
| 365       | 1168             | NR               | 495       | 28718            | NR               | 625       | 37861            | NR               | 755       | 1752             | NR               | 885       | 1913             | NR               |
| 370       | 1204             | NR               | 500       | 26605            | NR               | 630       | 59547            | NR               | 760       | 1690             | NR               | 890       | 2275             | NR               |
| 375       | 1232             | NR               | 505       | 25784            | NR               | 635       | 49312            | NR               | 765       | 1395             | NR               | 895       | 2173             | NR               |
| 380       | 1249             | NR               | 510       | 25614            | NR               | 640       | 28168            | NR               | 770       | 1452             | NR               | 900       | 1923             | NR               |
| 385       | 1285             | NR               | 515       | 25941            | NR               | 645       | 27115            | NR               | 775       | 1370             | NR               | 905       | 1511             | NR               |
| 390       | 1154             | NR               | 520       | 25900            | NR               | 650       | 24916            | NR               | 780       | 1429             | NR               | 910       | 1971             | NR               |
| 395       | 1036             | NR               | 525       | 26015            | NR               | 655       | 19572            | NR               | 785       | 1112             | NR               | 915       | 1957             | NR               |
| 400       | 873              | NR               | 530       | 26424            | NR               | 660       | 16766            | NR               | 790       | 1222             | NR               | 920       | 1699             | NR               |
| 405       | 908              | NR               | 535       | 26869            | NR               | 665       | 14487            | NR               | 795       | 1347             | NR               | 925       | 2123             | NR               |
| 410       | 1056             | NR               | 540       | 27684            | NR               | 670       | 12943            | NR               | 800       | 1132             | NR               | 930       | 2029             | NR               |
| 415       | 1492             | NR               | 545       | 28407            | NR               | 675       | 11228            | NR               | 805       | 1360             | NR               | 935       | 2371             | NR               |
| 420       | 2426             | NR               | 550       | 29571            | NR               | 680       | 9665             | NR               | 810       | 1451             | NR               | 940       | 1649             | NR               |
| 425       | 4409             | NR               | 555       | 30862            | NR               | 685       | 8389             | NR               | 815       | 1507             | NR               | 945       | 1984             | NR               |
| 430       | 7984             | NR               | 560       | 32297            | NR               | 690       | 7170             | NR               | 820       | 1466             | NR               | 950       | 1495             | NR               |
| 435       | 14687            | NR               | 565       | 33979            | NR               | 695       | 6398             | NR               | 825       | 1609             | NR               | 955       | 1862             | NR               |
| 440       | 26286            | NR               | 570       | 35579            | NR               | 700       | 5544             | NR               | 830       | 1642             | NR               | 960       | 2951             | NR               |
| 445       | 36513            | NR               | 575       | 36922            | NR               | 705       | 4845             | NR               | 835       | 1363             | NR               | 965       | 3240             | NR               |
| 450       | 34274            | NR               | 580       | 38319            | NR               | 710       | 4309             | NR               | 840       | 1294             | NR               | 970       | 3119             | NR               |
| 455       | 27519            | NR               | 585       | 39771            | NR               | 715       | 3879             | NR               | 845       | 1584             | NR               | 975       | 3020             | NR               |
| 460       | 26986            | NR               | 590       | 40329            | NR               | 720       | 3504             | NR               | 850       | 1930             | NR               | 980       | 3800             | NR               |
| 465       | 32511            | NR               | 595       | 40738            | NR               | 725       | 3094             | NR               | 855       | 1952             | NR               | 985       | 3748             | NR               |
| 470       | 41588            | NR               | 600       | 40944            | NR               | 730       | 2758             | NR               | 860       | 1631             | NR               | 990       | 2878             | NR               |
| 475       | 46297            | NR               | 605       | 41826            | NR               | 735       | 2441             | NR               | 865       | 1714             | NR               | 995       | 3708             | NR               |
| 480       | 42885            | NR               | 610       | 48714            | NR               | 740       | 2221             | NR               | 870       | 1878             | NR               | 1000      | 3359             | NR               |
| 485       | 35895            | NR               | 615       | 48984            | NR               | 745       | 2091             | NR               | 875       | 2024             | NR               |           |                  |                  |

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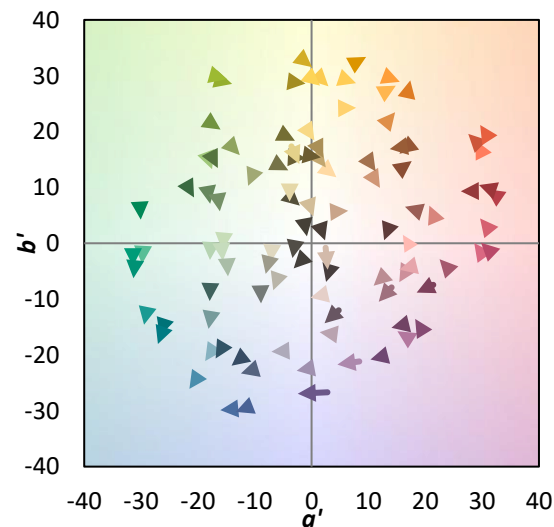
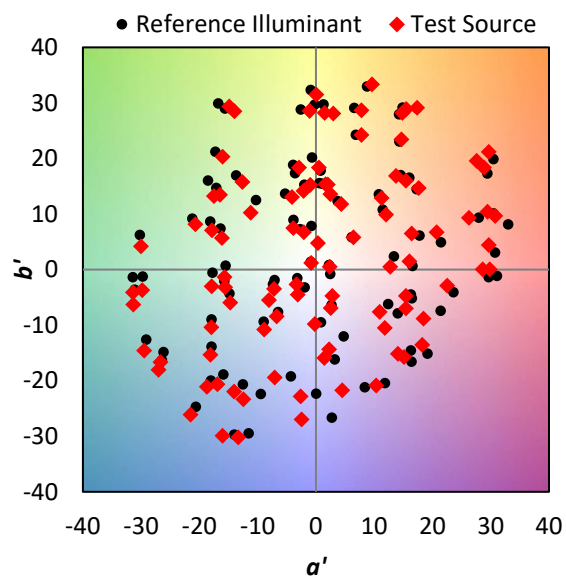
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**Summary**

$R_f = 88$   
 $R_g = 96.2$   
 CIE  $R_a = 87.8$   
 $R_g = 79.5$



**Color Vector Graphics**

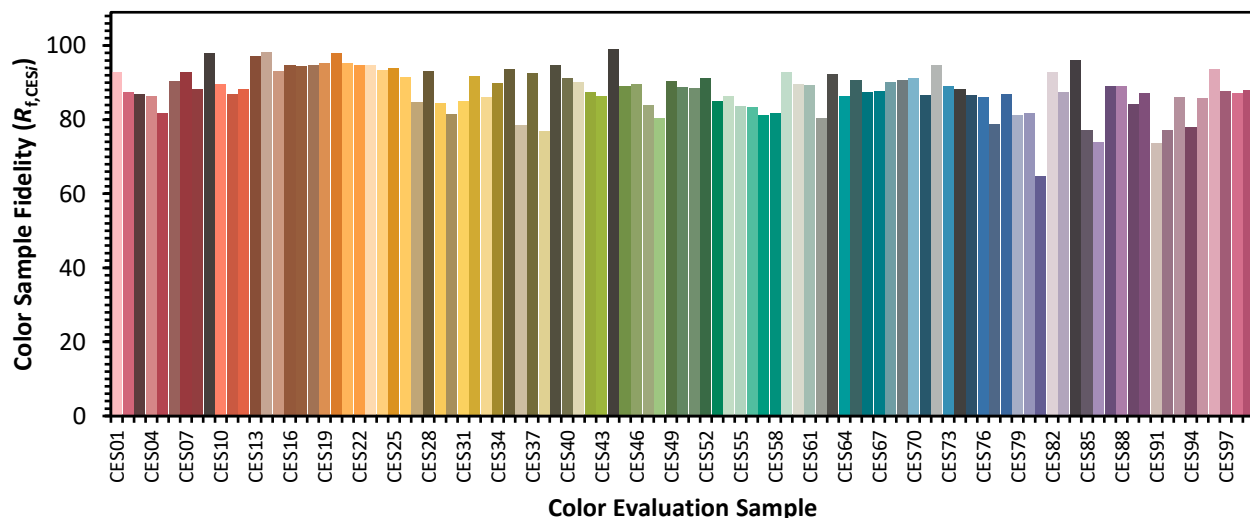


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Individual Sample Fidelity Index ( $R_{f,i}$ )

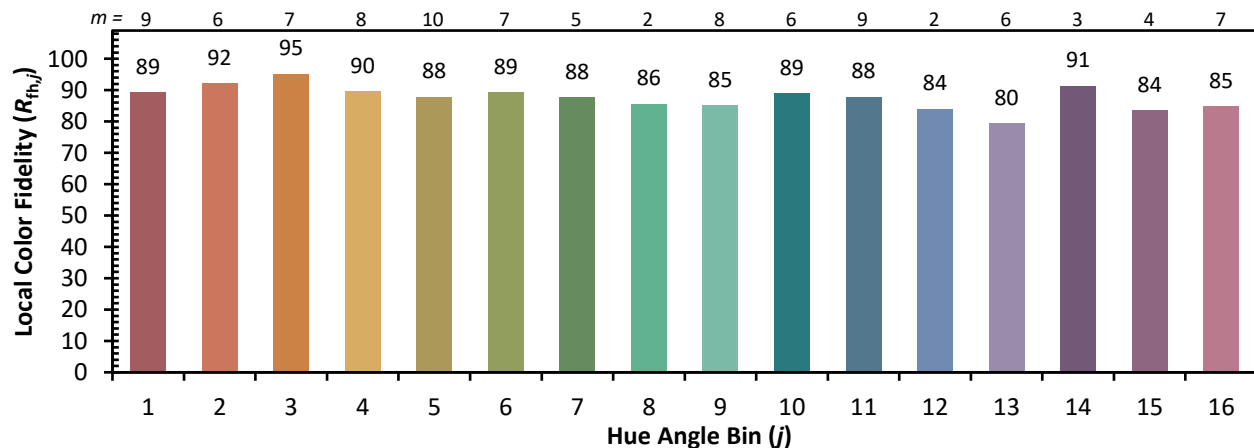
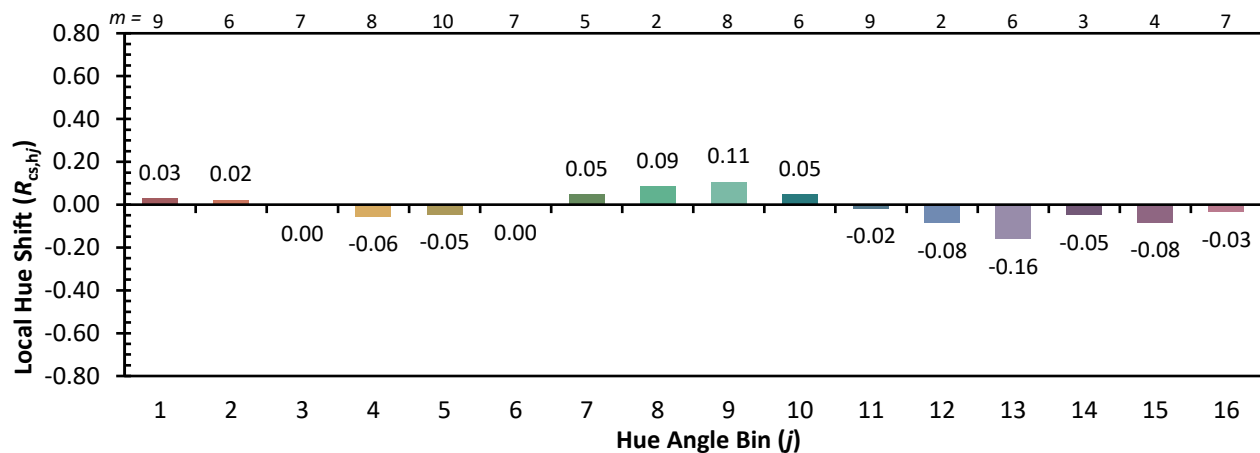
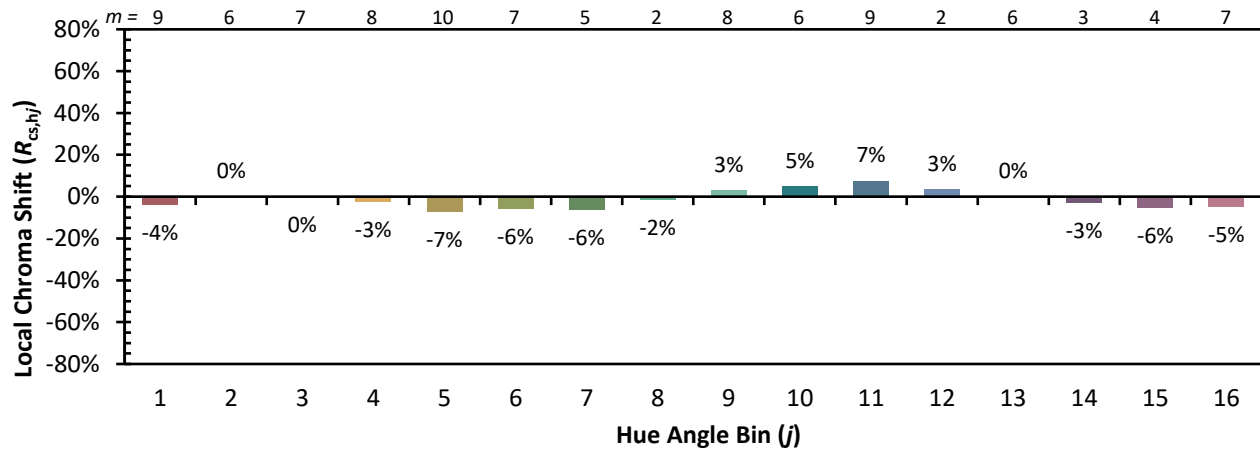
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 91 | CES51 = 88 | CES76 = 86 |
| CES02 = 62 | CES27 = 85 | CES52 = 91 | CES77 = 79 |
| CES03 = 31 | CES28 = 93 | CES53 = 85 | CES78 = 87 |
| CES04 = 70 | CES29 = 84 | CES54 = 86 | CES79 = 81 |
| CES05 = 49 | CES30 = 81 | CES55 = 84 | CES80 = 82 |
| CES06 = 51 | CES31 = 85 | CES56 = 83 | CES81 = 65 |
| CES07 = 42 | CES32 = 92 | CES57 = 81 | CES82 = 93 |
| CES08 = 41 | CES33 = 86 | CES58 = 82 | CES83 = 87 |
| CES09 = 29 | CES34 = 90 | CES59 = 93 | CES84 = 96 |
| CES10 = 75 | CES35 = 94 | CES60 = 90 | CES85 = 77 |
| CES11 = 58 | CES36 = 78 | CES61 = 89 | CES86 = 74 |
| CES12 = 64 | CES37 = 92 | CES62 = 80 | CES87 = 89 |
| CES13 = 43 | CES38 = 77 | CES63 = 92 | CES88 = 89 |
| CES14 = 74 | CES39 = 95 | CES64 = 86 | CES89 = 84 |
| CES15 = 71 | CES40 = 91 | CES65 = 91 | CES90 = 87 |
| CES16 = 47 | CES41 = 90 | CES66 = 87 | CES91 = 74 |
| CES17 = 49 | CES42 = 87 | CES67 = 88 | CES92 = 77 |
| CES18 = 56 | CES43 = 86 | CES68 = 90 | CES93 = 86 |
| CES19 = 71 | CES44 = 99 | CES69 = 91 | CES94 = 78 |
| CES20 = 66 | CES45 = 89 | CES70 = 91 | CES95 = 86 |
| CES21 = 85 | CES46 = 90 | CES71 = 86 | CES96 = 94 |
| CES22 = 78 | CES47 = 84 | CES72 = 95 | CES97 = 88 |
| CES23 = 91 | CES48 = 80 | CES73 = 89 | CES98 = 87 |
| CES24 = 90 | CES49 = 90 | CES74 = 88 | CES99 = 88 |
| CES25 = 71 | CES50 = 89 | CES75 = 86 |            |



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Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)