

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: FAIL-SAFE

Report Number: P733912

Luminaire Tested: **24FCZ2-30-B2750-W2D-CA08-3000K**

Issue Date: 1/5/2024



**Test Information**

Test Method: LM-79-08  
Report Number: P733912  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (P272053)  
Test Lab: INNOVATION CENTER(G3)  
Issue Date: 1/5/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: FAIL-SAFE  
Catalog Number: 24FCZ2-30-B2750-W2D-CA08-3000K  
Description: 2X4 3000 LUMEN SEALED CRUZE TROFFER WITH BIO UP LEDS AT 3000K CCT  
AND RIBBED LENS, WITH, CA08 BOTTOM LENS  
  
Light Source: -  
Ballast/Driver: -

**Summary**

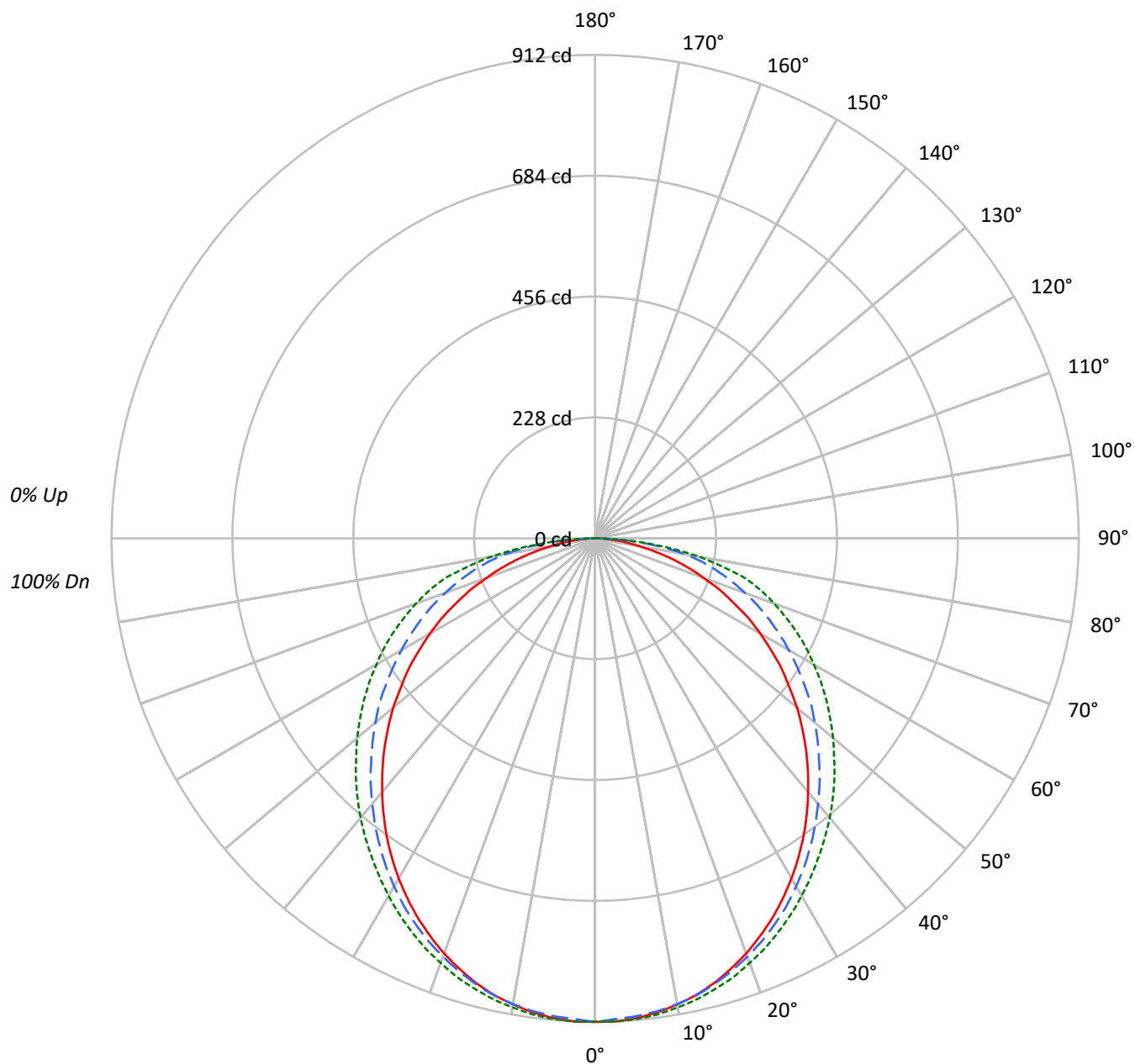
Lumens per Lamp: N/A  
Luminaire Lumens: 2717.0 lumens  
Efficiency: N/A  
Efficacy: 118.1 lumens/watt  
Spacing Criteria (0/90/45): 1.21 / 1.27 / 1.37  
Luminous Opening: Rectangular (W 1.92' x L: 3.98' x H: 0')  
CIE Type: Direct

Input Watts (W): 23  
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: P733912

CATALOG NUMBER: 24FCZ2-30-B2750-W2D-CA08-3000K

### Luminous Intensity Polar Plot





TEST NUMBER: P733912

CATALOG NUMBER: 24FCZ2-30-B2750-W2D-CA08-3000K

**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  | 82  | 76  | 95  | 87  | 80  | 75  | 83  | 78  | 73  | 80  | 75  | 71  | 77  | 73  | 70  | 67  |    |    |
| 3   | 89  | 78  | 69  | 62  | 86  | 76  | 68  | 62  | 73  | 66  | 61  | 70  | 64  | 60  | 68  | 63  | 58  | 56  |    |    |
| 4   | 81  | 69  | 59  | 52  | 79  | 67  | 59  | 52  | 65  | 57  | 51  | 62  | 56  | 51  | 60  | 55  | 50  | 48  |    |    |
| 5   | 74  | 61  | 52  | 45  | 72  | 60  | 51  | 45  | 58  | 50  | 44  | 56  | 49  | 44  | 54  | 48  | 43  | 41  |    |    |
| 6   | 69  | 55  | 46  | 39  | 67  | 54  | 45  | 39  | 52  | 44  | 39  | 50  | 44  | 38  | 49  | 43  | 38  | 36  |    |    |
| 7   | 64  | 50  | 41  | 35  | 62  | 49  | 40  | 34  | 47  | 40  | 34  | 46  | 39  | 34  | 45  | 38  | 34  | 32  |    |    |
| 8   | 59  | 45  | 37  | 31  | 58  | 45  | 36  | 31  | 43  | 36  | 30  | 42  | 35  | 30  | 41  | 35  | 30  | 28  |    |    |
| 9   | 55  | 42  | 33  | 28  | 54  | 41  | 33  | 28  | 40  | 33  | 27  | 39  | 32  | 27  | 38  | 32  | 27  | 25  |    |    |
| 10  | 52  | 38  | 30  | 25  | 51  | 38  | 30  | 25  | 37  | 30  | 25  | 36  | 29  | 25  | 35  | 29  | 25  | 23  |    |    |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 1288 | 1288 | 1288 |
| 5°  | 1287 | 1282 | 1290 |
| 10° | 1280 | 1279 | 1288 |
| 15° | 1269 | 1272 | 1285 |
| 20° | 1252 | 1261 | 1280 |
| 25° | 1231 | 1250 | 1275 |
| 30° | 1207 | 1235 | 1269 |
| 35° | 1181 | 1220 | 1265 |
| 40° | 1151 | 1205 | 1268 |
| 45° | 1122 | 1193 | 1274 |
| 50° | 1091 | 1187 | 1286 |
| 55° | 1058 | 1185 | 1310 |
| 60° | 1016 | 1190 | 1344 |
| 65° | 963  | 1208 | 1402 |
| 70° | 894  | 1238 | 1482 |
| 75° | 816  | 1301 | 1607 |
| 80° | 671  | 1400 | 1607 |
| 85° | 513  | 1292 | 1380 |



TEST NUMBER: P733912

CATALOG NUMBER: 24FCZ2-30-B2750-W2D-CA08-3000K

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 86.3   | 3.2       |
| 10°-20°   | 246.3  | 9.1       |
| 20°-30°   | 370.7  | 13.6      |
| 30°-40°   | 444.2  | 16.3      |
| 40°-50°   | 462.9  | 17.0      |
| 50°-60°   | 430.7  | 15.9      |
| 60°-70°   | 354.7  | 13.1      |
| 70°-80°   | 241.6  | 8.9       |
| 80°-90°   | 79.8   | 2.9       |
| 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       |
| <hr/>     |        |           |
| 0°-30°    | 703.2  | 25.9      |
| 0°-40°    | 1147.4 | 42.2      |
| 0°-60°    | 2041.0 | 75.1      |
| 0°-90°    | 2717.0 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 2717.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°  | 22.5° | 45° | 67.5° | 90° | Flux |
|-----|-----|-------|-----|-------|-----|------|
| 0°  | 912 | 912   | 912 | 912   | 912 |      |
| 5°  | 908 | 908   | 905 | 910   | 910 | 86   |
| 15° | 869 | 870   | 870 | 879   | 880 | 245  |
| 25° | 791 | 794   | 802 | 816   | 819 | 364  |
| 35° | 686 | 694   | 708 | 727   | 734 | 429  |
| 45° | 562 | 574   | 598 | 627   | 638 | 434  |
| 55° | 430 | 444   | 482 | 520   | 532 | 383  |
| 65° | 288 | 313   | 362 | 404   | 420 | 286  |
| 75° | 150 | 183   | 238 | 281   | 295 | 158  |
| 85° | 32  | 62    | 80  | 85    | 85  | 39   |
| 90° | 0   | 0     | 0   | 0     | 0   |      |



TEST NUMBER: P733912

CATALOG NUMBER: 24FCZ2-30-B2750-W2D-CA08-3000K

**CANDELA DISTRIBUTION (FULL):**

|       | 0°    | 22.5° | 45°   | 67.5° | 90°   |
|-------|-------|-------|-------|-------|-------|
| 0°    | 912.3 | 912.3 | 912.3 | 912.3 | 912.3 |
| 2.5°  | 912.3 | 912.3 | 907.7 | 912.3 | 912.3 |
| 5°    | 908.5 | 908.5 | 904.9 | 909.5 | 910.4 |
| 7.5°  | 902.2 | 903.2 | 899.6 | 904.9 | 905.9 |
| 10°   | 893.1 | 894.1 | 892.3 | 897.7 | 898.6 |
| 12.5° | 882.3 | 883.2 | 883.2 | 889.5 | 890.5 |
| 15°   | 868.7 | 869.6 | 870.5 | 878.7 | 879.6 |
| 17.5° | 851.5 | 854.2 | 856.0 | 866.0 | 867.8 |
| 20°   | 833.4 | 836.1 | 839.7 | 850.5 | 852.4 |
| 22.5° | 812.5 | 816.1 | 822.4 | 834.2 | 837.0 |
| 25°   | 790.7 | 794.3 | 802.5 | 816.1 | 818.8 |
| 27.5° | 766.3 | 771.7 | 781.7 | 796.2 | 799.8 |
| 30°   | 740.9 | 746.2 | 758.1 | 773.5 | 778.9 |
| 32.5° | 713.7 | 720.9 | 734.4 | 751.7 | 757.2 |
| 35°   | 685.5 | 693.7 | 708.2 | 727.2 | 734.4 |
| 37.5° | 655.6 | 664.7 | 681.9 | 702.8 | 711.8 |
| 40°   | 624.8 | 635.6 | 653.8 | 678.3 | 688.2 |
| 42.5° | 593.9 | 604.0 | 626.6 | 652.9 | 663.7 |
| 45°   | 562.2 | 574.0 | 597.6 | 627.4 | 638.4 |
| 47.5° | 529.5 | 541.3 | 569.4 | 601.2 | 611.2 |
| 50°   | 497.0 | 508.8 | 540.5 | 574.0 | 585.8 |
| 52.5° | 461.5 | 477.0 | 513.2 | 546.8 | 558.6 |
| 55°   | 429.8 | 444.3 | 481.5 | 519.6 | 532.3 |
| 57.5° | 393.6 | 410.7 | 451.6 | 491.5 | 505.0 |
| 60°   | 360.0 | 378.2 | 421.7 | 462.4 | 476.1 |
| 62.5° | 325.6 | 345.5 | 391.7 | 433.5 | 448.9 |
| 65°   | 288.3 | 312.8 | 361.8 | 404.4 | 419.8 |
| 67.5° | 254.8 | 280.2 | 331.9 | 375.4 | 389.0 |
| 70°   | 216.7 | 247.5 | 300.1 | 343.7 | 359.1 |
| 72.5° | 184.0 | 214.9 | 270.2 | 312.8 | 328.2 |
| 75°   | 149.6 | 183.2 | 238.5 | 281.1 | 294.7 |
| 77.5° | 115.2 | 152.4 | 207.7 | 240.3 | 244.8 |
| 80°   | 82.5  | 121.5 | 172.2 | 191.4 | 197.7 |
| 82.5° | 58.0  | 93.4  | 127.0 | 139.7 | 143.3 |
| 85°   | 31.7  | 61.6  | 79.8  | 85.2  | 85.2  |
| 87.5° | 13.6  | 26.3  | 31.7  | 32.7  | 33.6  |
| 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: SP1-2210-795-2

Test Date: 10/06/2022

Luminaire Tested: 9WP217084MDER4AM-3000K-315MA

Data in this report applies to families of products including 9WP217084MDER4AM-3000K.

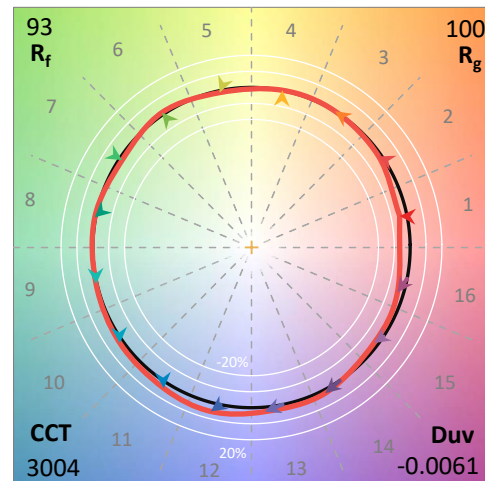
### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2210-795-2  
 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-3000K-315MA**  
 Description: METALUX

TUNABLE BOARD, 3000K-315MA, PROGRAMMED @ 2.6Vdc.

### Spectral Parameters

|                           |         |           |      |      |      |
|---------------------------|---------|-----------|------|------|------|
| CCT (K):                  | 3004    | CRI (Ra): | 93.2 |      |      |
| CIE u':                   | 0.2526  | R1:       | 98.5 | R9:  | 67.1 |
| CIE v':                   | 0.5127  | R2:       | 96.3 | R10: | 94.0 |
| Duv:                      | -0.0061 | R3:       | 94.1 | R11: | 97.7 |
| CIE x:                    | 0.4279  | R4:       | 96.5 | R12: | 86.0 |
| CIE y:                    | 0.3860  | R5:       | 98.5 | R13: | 98.4 |
| CIE z:                    | 0.1861  | R6:       | 90.3 | R14: | 98.1 |
| Peak Wavelength (nm):     | 632     | R7:       | 88.3 |      |      |
| Dominant Wavelength (nm): | 585     | R8:       | 83.1 |      |      |
| Purity:                   | 44.5    |           |      |      |      |
| Rf:                       | 92.5    |           |      |      |      |
| Rg:                       | 99.9    |           |      |      |      |



### Test Conditions

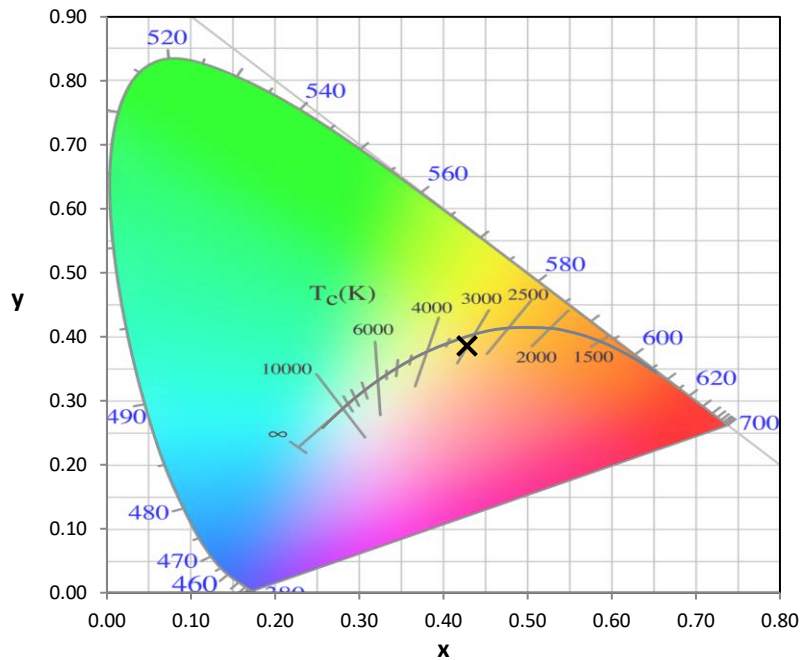
Stabilization Time: 53M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.0/38%  
 Sphere Temperature (°C): 24.4

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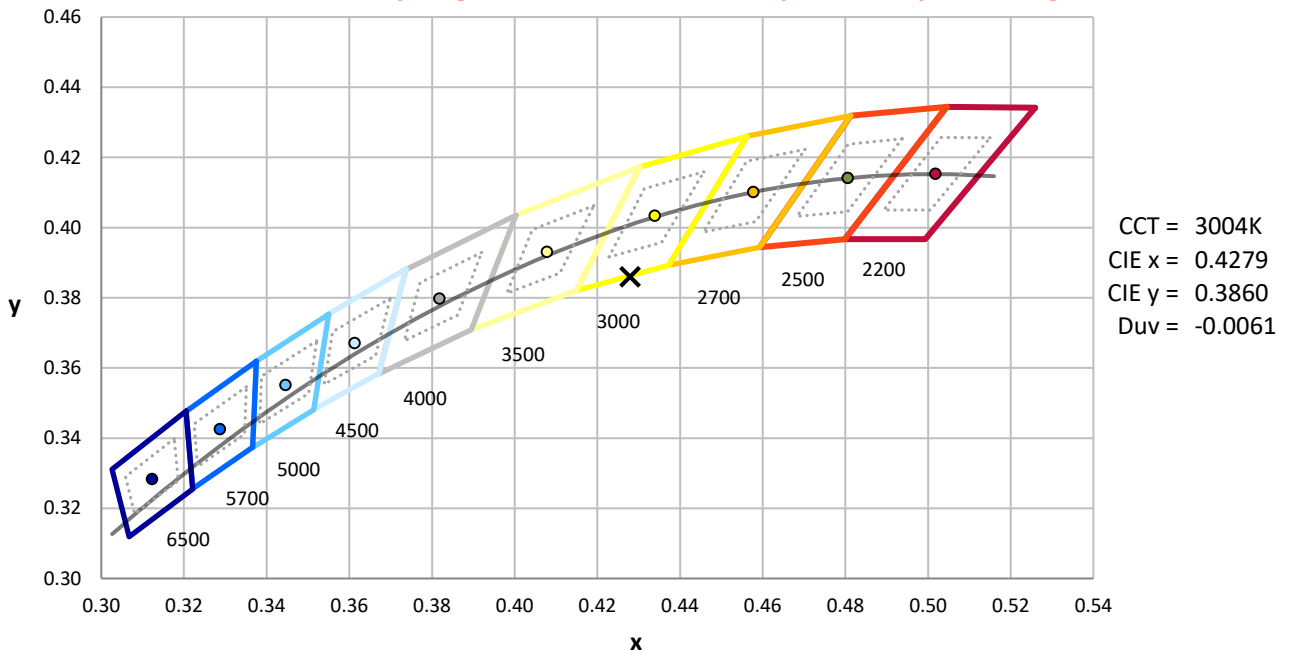
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| 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           |

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**CIE 1931 Chromaticity Diagram**



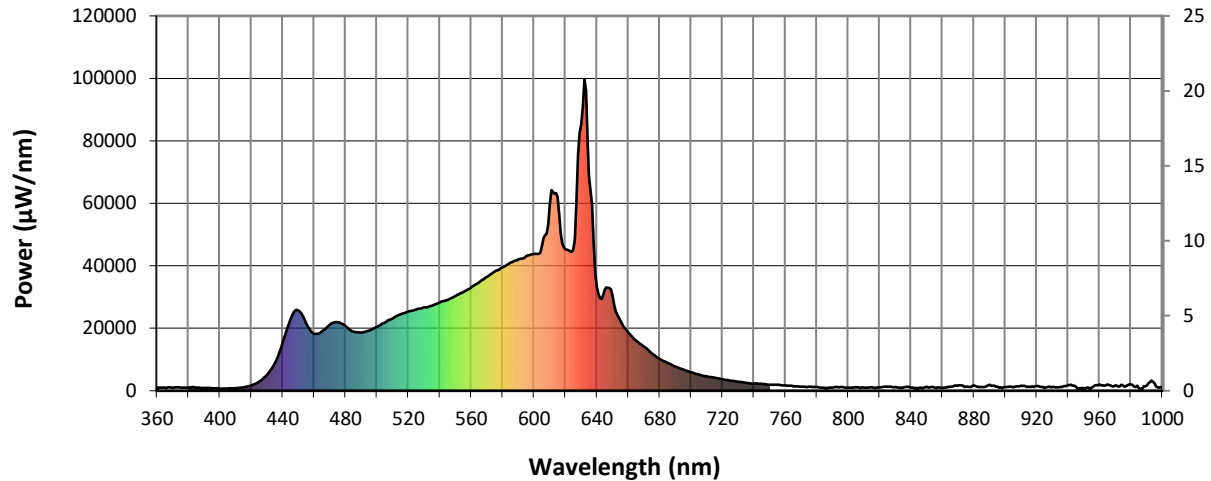
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies outside the range

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**Photopic Flux vs. Wavelength**

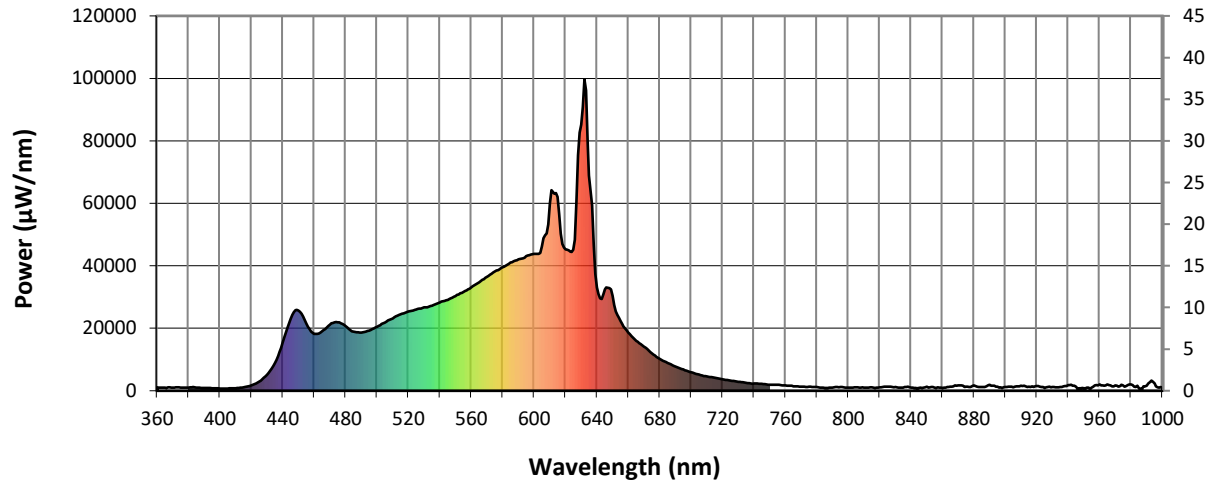


#####

| 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       | 1141             | NR               | 490       | 18648            | NR               | 620       | 45240            | NR               | 750       | 1949             | NR               | 880       | 1696             | NR               |
| 365       | 981              | NR               | 495       | 19266            | NR               | 625       | 45103            | NR               | 755       | 1928             | NR               | 885       | 1176             | NR               |
| 370       | 993              | NR               | 500       | 20501            | NR               | 630       | 85243            | NR               | 760       | 1686             | NR               | 890       | 1892             | NR               |
| 375       | 1026             | NR               | 505       | 21835            | NR               | 635       | 68928            | NR               | 765       | 1435             | NR               | 895       | 1303             | NR               |
| 380       | 1011             | NR               | 510       | 23128            | NR               | 640       | 33096            | NR               | 770       | 1270             | NR               | 900       | 1197             | NR               |
| 385       | 1002             | NR               | 515       | 24473            | NR               | 645       | 32437            | NR               | 775       | 1334             | NR               | 905       | 1148             | NR               |
| 390       | 868              | NR               | 520       | 25336            | NR               | 650       | 30398            | NR               | 780       | 1218             | NR               | 910       | 1595             | NR               |
| 395       | 834              | NR               | 525       | 26013            | NR               | 655       | 22347            | NR               | 785       | 928              | NR               | 915       | 1266             | NR               |
| 400       | 731              | NR               | 530       | 26667            | NR               | 660       | 18602            | NR               | 790       | 989              | NR               | 920       | 1495             | NR               |
| 405       | 725              | NR               | 535       | 27195            | NR               | 665       | 15938            | NR               | 795       | 1224             | NR               | 925       | 855              | NR               |
| 410       | 825              | NR               | 540       | 28268            | NR               | 670       | 14142            | NR               | 800       | 1005             | NR               | 930       | 1185             | NR               |
| 415       | 1102             | NR               | 545       | 29091            | NR               | 675       | 11970            | NR               | 805       | 1076             | NR               | 935       | 1186             | NR               |
| 420       | 1695             | NR               | 550       | 30262            | NR               | 680       | 10212            | NR               | 810       | 1018             | NR               | 940       | 1843             | NR               |
| 425       | 2899             | NR               | 555       | 31582            | NR               | 685       | 8911             | NR               | 815       | 1059             | NR               | 945       | 1344             | NR               |
| 430       | 5092             | NR               | 560       | 33069            | NR               | 690       | 7775             | NR               | 820       | 1047             | NR               | 950       | 827              | NR               |
| 435       | 8866             | NR               | 565       | 34747            | NR               | 695       | 6796             | NR               | 825       | 1259             | NR               | 955       | 984              | NR               |
| 440       | 15398            | NR               | 570       | 36451            | NR               | 700       | 5894             | NR               | 830       | 1151             | NR               | 960       | 1985             | NR               |
| 445       | 23004            | NR               | 575       | 38145            | NR               | 705       | 5150             | NR               | 835       | 1045             | NR               | 965       | 2009             | NR               |
| 450       | 25734            | NR               | 580       | 39543            | NR               | 710       | 4545             | NR               | 840       | 1037             | NR               | 970       | 1686             | NR               |
| 455       | 21534            | NR               | 585       | 41063            | NR               | 715       | 4197             | NR               | 845       | 888              | NR               | 975       | 1733             | NR               |
| 460       | 18246            | NR               | 590       | 42070            | NR               | 720       | 3650             | NR               | 850       | 1271             | NR               | 980       | 2039             | NR               |
| 465       | 18978            | NR               | 595       | 43067            | NR               | 725       | 3265             | NR               | 855       | 1028             | NR               | 985       | 919              | NR               |
| 470       | 21128            | NR               | 600       | 43863            | NR               | 730       | 2885             | NR               | 860       | 867              | NR               | 990       | 1621             | NR               |
| 475       | 21866            | NR               | 605       | 46127            | NR               | 735       | 2521             | NR               | 865       | 1316             | NR               | 995       | 2360             | NR               |
| 480       | 20628            | NR               | 610       | 59905            | NR               | 740       | 2317             | NR               | 870       | 1674             | NR               | 1000      | 905              | NR               |
| 485       | 18888            | NR               | 615       | 62018            | NR               | 745       | 2212             | NR               | 875       | 1299             | NR               |           |                  |                  |

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Scotopic Flux vs. Wavelength



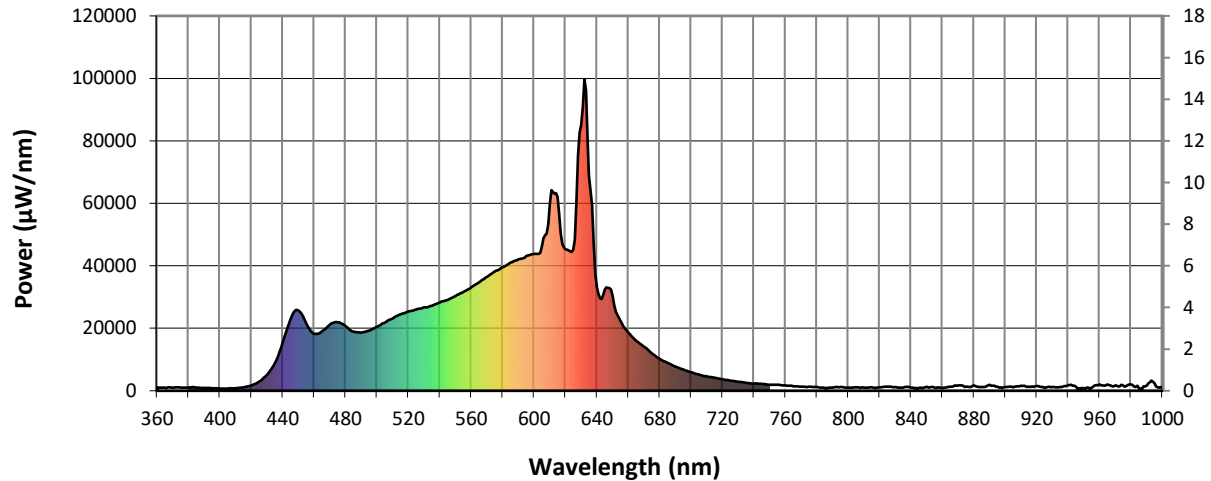
Scotopic Lumens: 3849.1

S/P: 1.53

| 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       | 1141             | NR               | 490       | 18648            | NR               | 620       | 45240            | NR               | 750       | 1949             | NR               | 880       | 1696             | NR               |
| 365       | 981              | NR               | 495       | 19266            | NR               | 625       | 45103            | NR               | 755       | 1928             | NR               | 885       | 1176             | NR               |
| 370       | 993              | NR               | 500       | 20501            | NR               | 630       | 85243            | NR               | 760       | 1686             | NR               | 890       | 1892             | NR               |
| 375       | 1026             | NR               | 505       | 21835            | NR               | 635       | 68928            | NR               | 765       | 1435             | NR               | 895       | 1303             | NR               |
| 380       | 1011             | NR               | 510       | 23128            | NR               | 640       | 33096            | NR               | 770       | 1270             | NR               | 900       | 1197             | NR               |
| 385       | 1002             | NR               | 515       | 24473            | NR               | 645       | 32437            | NR               | 775       | 1334             | NR               | 905       | 1148             | NR               |
| 390       | 868              | NR               | 520       | 25336            | NR               | 650       | 30398            | NR               | 780       | 1218             | NR               | 910       | 1595             | NR               |
| 395       | 834              | NR               | 525       | 26013            | NR               | 655       | 22347            | NR               | 785       | 928              | NR               | 915       | 1266             | NR               |
| 400       | 731              | NR               | 530       | 26667            | NR               | 660       | 18602            | NR               | 790       | 989              | NR               | 920       | 1495             | NR               |
| 405       | 725              | NR               | 535       | 27195            | NR               | 665       | 15938            | NR               | 795       | 1224             | NR               | 925       | 855              | NR               |
| 410       | 825              | NR               | 540       | 28268            | NR               | 670       | 14142            | NR               | 800       | 1005             | NR               | 930       | 1185             | NR               |
| 415       | 1102             | NR               | 545       | 29091            | NR               | 675       | 11970            | NR               | 805       | 1076             | NR               | 935       | 1186             | NR               |
| 420       | 1695             | NR               | 550       | 30262            | NR               | 680       | 10212            | NR               | 810       | 1018             | NR               | 940       | 1843             | NR               |
| 425       | 2899             | NR               | 555       | 31582            | NR               | 685       | 8911             | NR               | 815       | 1059             | NR               | 945       | 1344             | NR               |
| 430       | 5092             | NR               | 560       | 33069            | NR               | 690       | 7775             | NR               | 820       | 1047             | NR               | 950       | 827              | NR               |
| 435       | 8866             | NR               | 565       | 34747            | NR               | 695       | 6796             | NR               | 825       | 1259             | NR               | 955       | 984              | NR               |
| 440       | 15398            | NR               | 570       | 36451            | NR               | 700       | 5894             | NR               | 830       | 1151             | NR               | 960       | 1985             | NR               |
| 445       | 23004            | NR               | 575       | 38145            | NR               | 705       | 5150             | NR               | 835       | 1045             | NR               | 965       | 2009             | NR               |
| 450       | 25734            | NR               | 580       | 39543            | NR               | 710       | 4545             | NR               | 840       | 1037             | NR               | 970       | 1686             | NR               |
| 455       | 21534            | NR               | 585       | 41063            | NR               | 715       | 4197             | NR               | 845       | 888              | NR               | 975       | 1733             | NR               |
| 460       | 18246            | NR               | 590       | 42070            | NR               | 720       | 3650             | NR               | 850       | 1271             | NR               | 980       | 2039             | NR               |
| 465       | 18978            | NR               | 595       | 43067            | NR               | 725       | 3265             | NR               | 855       | 1028             | NR               | 985       | 919              | NR               |
| 470       | 21128            | NR               | 600       | 43863            | NR               | 730       | 2885             | NR               | 860       | 867              | NR               | 990       | 1621             | NR               |
| 475       | 21866            | NR               | 605       | 46127            | NR               | 735       | 2521             | NR               | 865       | 1316             | NR               | 995       | 2360             | NR               |
| 480       | 20628            | NR               | 610       | 59905            | NR               | 740       | 2317             | NR               | 870       | 1674             | NR               | 1000      | 905              | NR               |
| 485       | 18888            | NR               | 615       | 62018            | NR               | 745       | 2212             | NR               | 875       | 1299             | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 1558.5 S/P: 0.62**

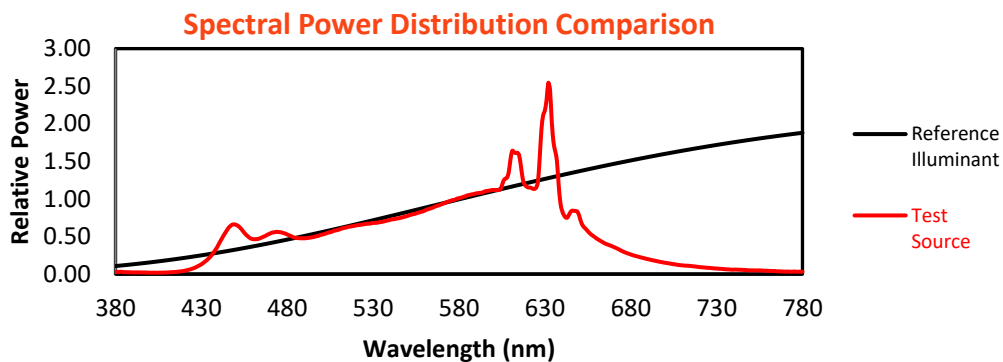
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1141             | NR               | 490       | 18648            | NR               | 620       | 45240            | NR               | 750       | 1949             | NR               | 880       | 1696             | NR               |
| 365       | 981              | NR               | 495       | 19266            | NR               | 625       | 45103            | NR               | 755       | 1928             | NR               | 885       | 1176             | NR               |
| 370       | 993              | NR               | 500       | 20501            | NR               | 630       | 85243            | NR               | 760       | 1686             | NR               | 890       | 1892             | NR               |
| 375       | 1026             | NR               | 505       | 21835            | NR               | 635       | 68928            | NR               | 765       | 1435             | NR               | 895       | 1303             | NR               |
| 380       | 1011             | NR               | 510       | 23128            | NR               | 640       | 33096            | NR               | 770       | 1270             | NR               | 900       | 1197             | NR               |
| 385       | 1002             | NR               | 515       | 24473            | NR               | 645       | 32437            | NR               | 775       | 1334             | NR               | 905       | 1148             | NR               |
| 390       | 868              | NR               | 520       | 25336            | NR               | 650       | 30398            | NR               | 780       | 1218             | NR               | 910       | 1595             | NR               |
| 395       | 834              | NR               | 525       | 26013            | NR               | 655       | 22347            | NR               | 785       | 928              | NR               | 915       | 1266             | NR               |
| 400       | 731              | NR               | 530       | 26667            | NR               | 660       | 18602            | NR               | 790       | 989              | NR               | 920       | 1495             | NR               |
| 405       | 725              | NR               | 535       | 27195            | NR               | 665       | 15938            | NR               | 795       | 1224             | NR               | 925       | 855              | NR               |
| 410       | 825              | NR               | 540       | 28268            | NR               | 670       | 14142            | NR               | 800       | 1005             | NR               | 930       | 1185             | NR               |
| 415       | 1102             | NR               | 545       | 29091            | NR               | 675       | 11970            | NR               | 805       | 1076             | NR               | 935       | 1186             | NR               |
| 420       | 1695             | NR               | 550       | 30262            | NR               | 680       | 10212            | NR               | 810       | 1018             | NR               | 940       | 1843             | NR               |
| 425       | 2899             | NR               | 555       | 31582            | NR               | 685       | 8911             | NR               | 815       | 1059             | NR               | 945       | 1344             | NR               |
| 430       | 5092             | NR               | 560       | 33069            | NR               | 690       | 7775             | NR               | 820       | 1047             | NR               | 950       | 827              | NR               |
| 435       | 8866             | NR               | 565       | 34747            | NR               | 695       | 6796             | NR               | 825       | 1259             | NR               | 955       | 984              | NR               |
| 440       | 15398            | NR               | 570       | 36451            | NR               | 700       | 5894             | NR               | 830       | 1151             | NR               | 960       | 1985             | NR               |
| 445       | 23004            | NR               | 575       | 38145            | NR               | 705       | 5150             | NR               | 835       | 1045             | NR               | 965       | 2009             | NR               |
| 450       | 25734            | NR               | 580       | 39543            | NR               | 710       | 4545             | NR               | 840       | 1037             | NR               | 970       | 1686             | NR               |
| 455       | 21534            | NR               | 585       | 41063            | NR               | 715       | 4197             | NR               | 845       | 888              | NR               | 975       | 1733             | NR               |
| 460       | 18246            | NR               | 590       | 42070            | NR               | 720       | 3650             | NR               | 850       | 1271             | NR               | 980       | 2039             | NR               |
| 465       | 18978            | NR               | 595       | 43067            | NR               | 725       | 3265             | NR               | 855       | 1028             | NR               | 985       | 919              | NR               |
| 470       | 21128            | NR               | 600       | 43863            | NR               | 730       | 2885             | NR               | 860       | 867              | NR               | 990       | 1621             | NR               |
| 475       | 21866            | NR               | 605       | 46127            | NR               | 735       | 2521             | NR               | 865       | 1316             | NR               | 995       | 2360             | NR               |
| 480       | 20628            | NR               | 610       | 59905            | NR               | 740       | 2317             | NR               | 870       | 1674             | NR               | 1000      | 905              | NR               |
| 485       | 18888            | NR               | 615       | 62018            | NR               | 745       | 2212             | NR               | 875       | 1299             | NR               |           |                  |                  |

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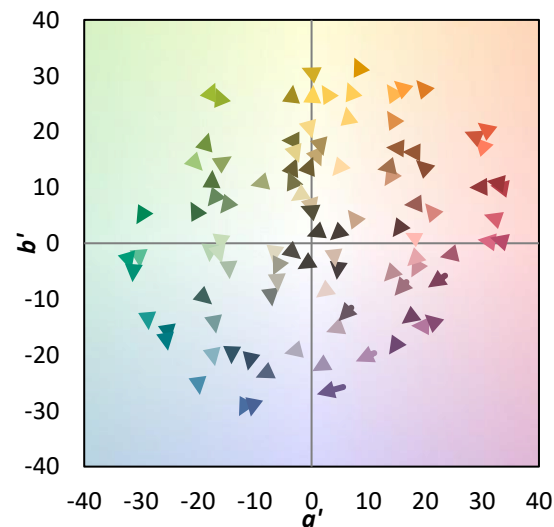
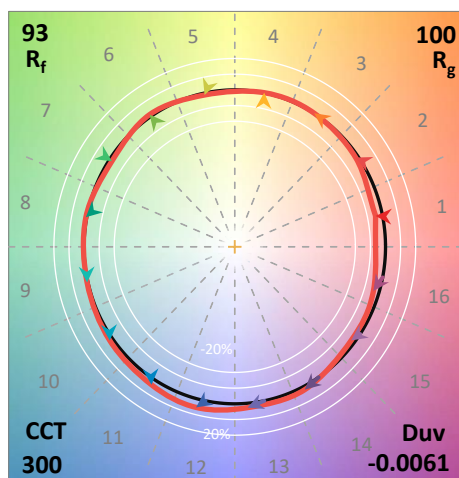
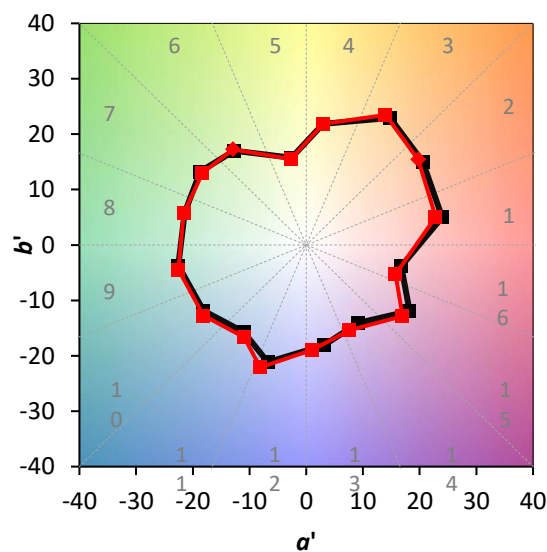
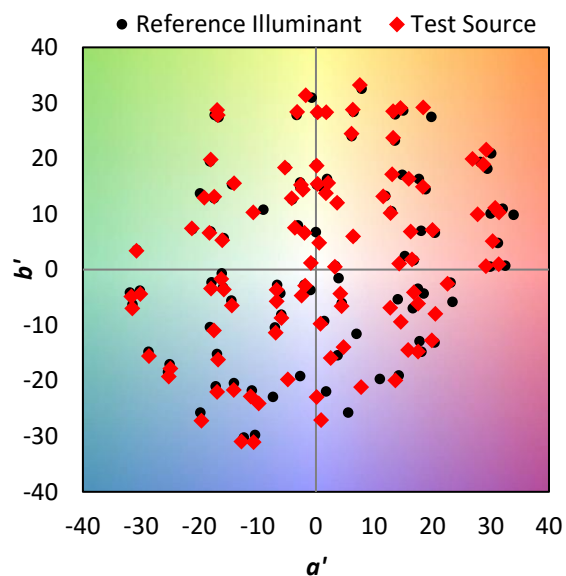
TM-30-18

### Summary

$R_f = 92.5$   
 $R_g = 99.9$   
 CIE  $R_a = 93.2$   
 $R_g = 67.1$



### Color Vector Graphics

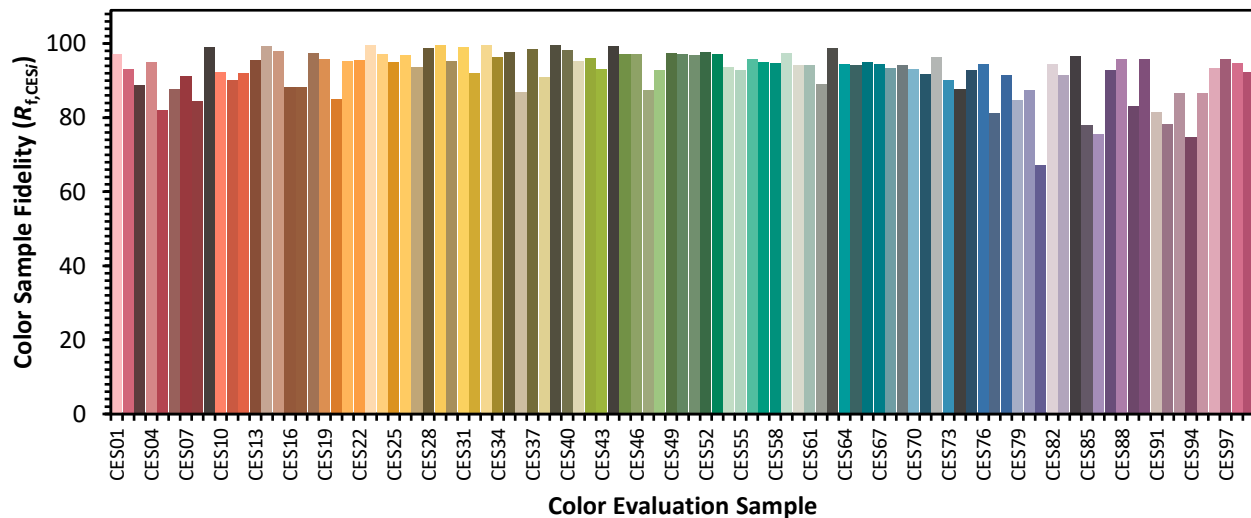


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**Individual Sample Fidelity Index ( $R_{f,i}$ )**

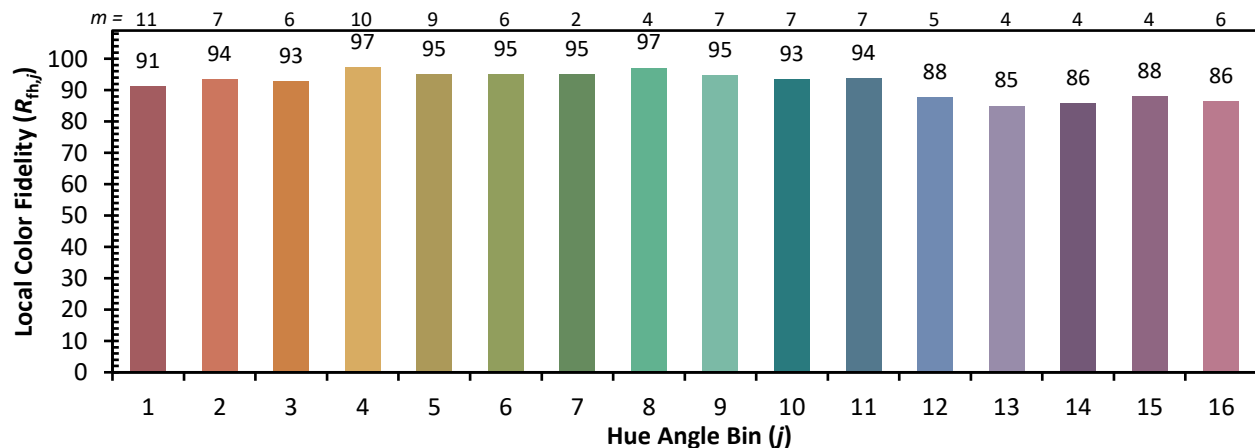
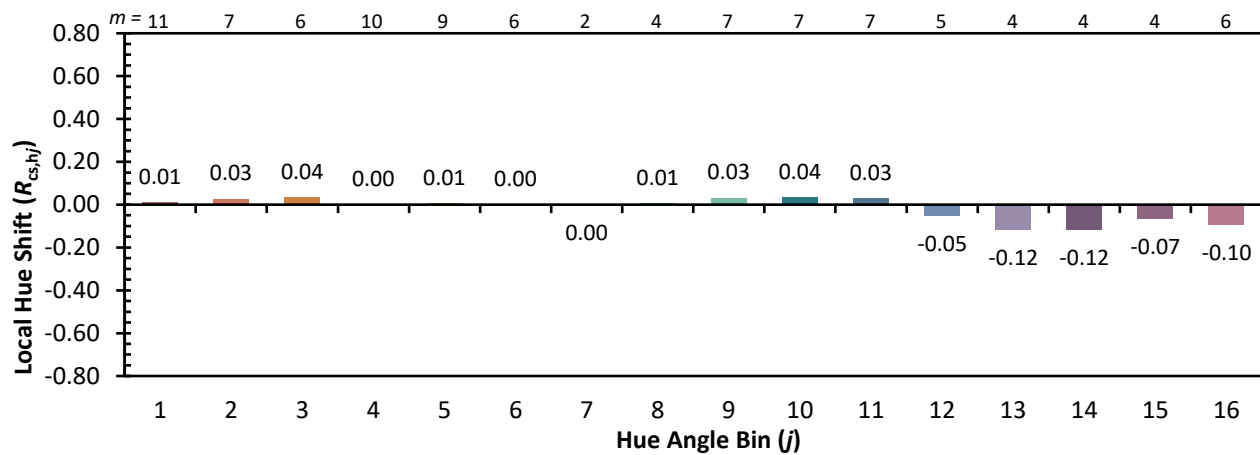
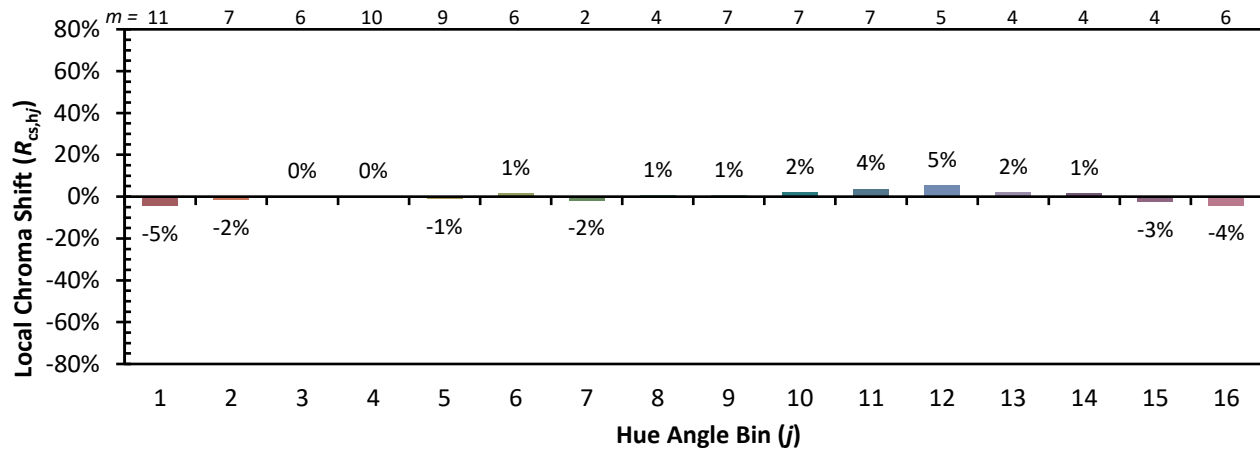
|            |             |            |            |
|------------|-------------|------------|------------|
| CES01 = 86 | CES26 = 97  | CES51 = 97 | CES76 = 94 |
| CES02 = 63 | CES27 = 93  | CES52 = 98 | CES77 = 81 |
| CES03 = 32 | CES28 = 99  | CES53 = 97 | CES78 = 91 |
| CES04 = 70 | CES29 = 99  | CES54 = 93 | CES79 = 85 |
| CES05 = 51 | CES30 = 95  | CES55 = 93 | CES80 = 87 |
| CES06 = 51 | CES31 = 99  | CES56 = 96 | CES81 = 67 |
| CES07 = 44 | CES32 = 92  | CES57 = 95 | CES82 = 94 |
| CES08 = 42 | CES33 = 99  | CES58 = 95 | CES83 = 91 |
| CES09 = 29 | CES34 = 96  | CES59 = 97 | CES84 = 97 |
| CES10 = 76 | CES35 = 98  | CES60 = 94 | CES85 = 78 |
| CES11 = 59 | CES36 = 87  | CES61 = 94 | CES86 = 76 |
| CES12 = 65 | CES37 = 98  | CES62 = 89 | CES87 = 93 |
| CES13 = 44 | CES38 = 91  | CES63 = 99 | CES88 = 96 |
| CES14 = 74 | CES39 = 100 | CES64 = 94 | CES89 = 83 |
| CES15 = 72 | CES40 = 98  | CES65 = 94 | CES90 = 96 |
| CES16 = 48 | CES41 = 95  | CES66 = 95 | CES91 = 81 |
| CES17 = 50 | CES42 = 96  | CES67 = 94 | CES92 = 78 |
| CES18 = 57 | CES43 = 93  | CES68 = 93 | CES93 = 86 |
| CES19 = 72 | CES44 = 99  | CES69 = 94 | CES94 = 75 |
| CES20 = 67 | CES45 = 97  | CES70 = 93 | CES95 = 86 |
| CES21 = 86 | CES46 = 97  | CES71 = 92 | CES96 = 93 |
| CES22 = 79 | CES47 = 87  | CES72 = 96 | CES97 = 96 |
| CES23 = 92 | CES48 = 93  | CES73 = 90 | CES98 = 95 |
| CES24 = 90 | CES49 = 97  | CES74 = 88 | CES99 = 92 |
| CES25 = 72 | CES50 = 97  | CES75 = 93 |            |



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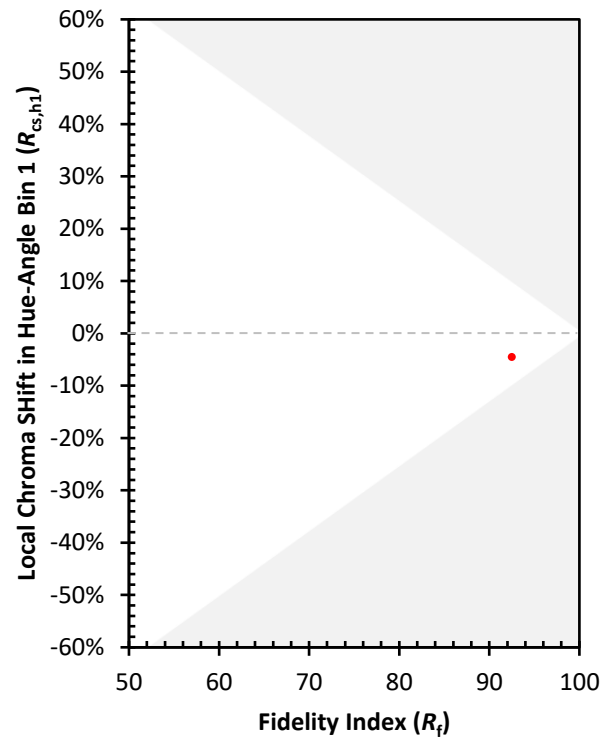
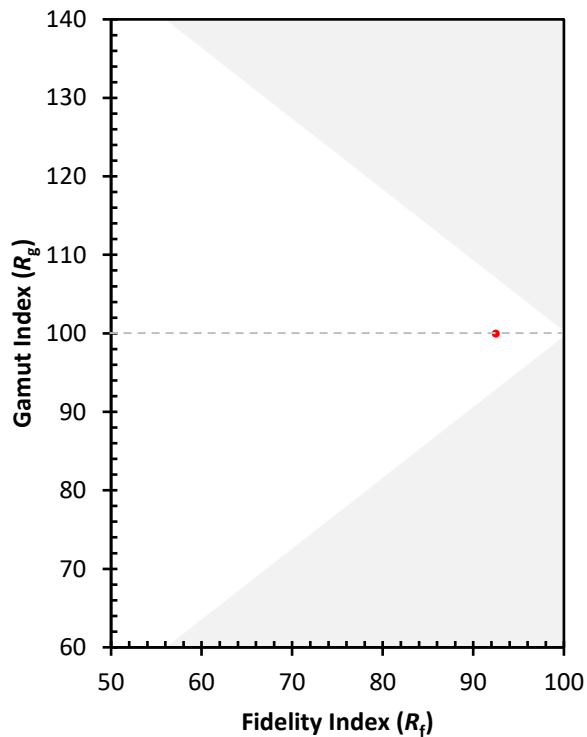
**Color Rendition by Hue-Angle Bin**



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**Measure Comparisons**



(END OF REPORT)