

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: P861184

Luminaire Tested: **4APVTLD-SL3C3 HI POWER 3500K 277V**

Issue Date: 1/31/2023



**Test Information**

Test Method: LM-79-08  
Report Number: P861184  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-2210-820-8)  
Test Lab: INNOVATION CENTER  
Issue Date: 1/31/2023  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: FAIL-SAFE  
Catalog Number: 4APVTLD-SL3C3 HI POWER 3500K 277V  
Description: HI POWER  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER  
Luminaire Equipment: Sample No.   Condition   Description

**Summary**

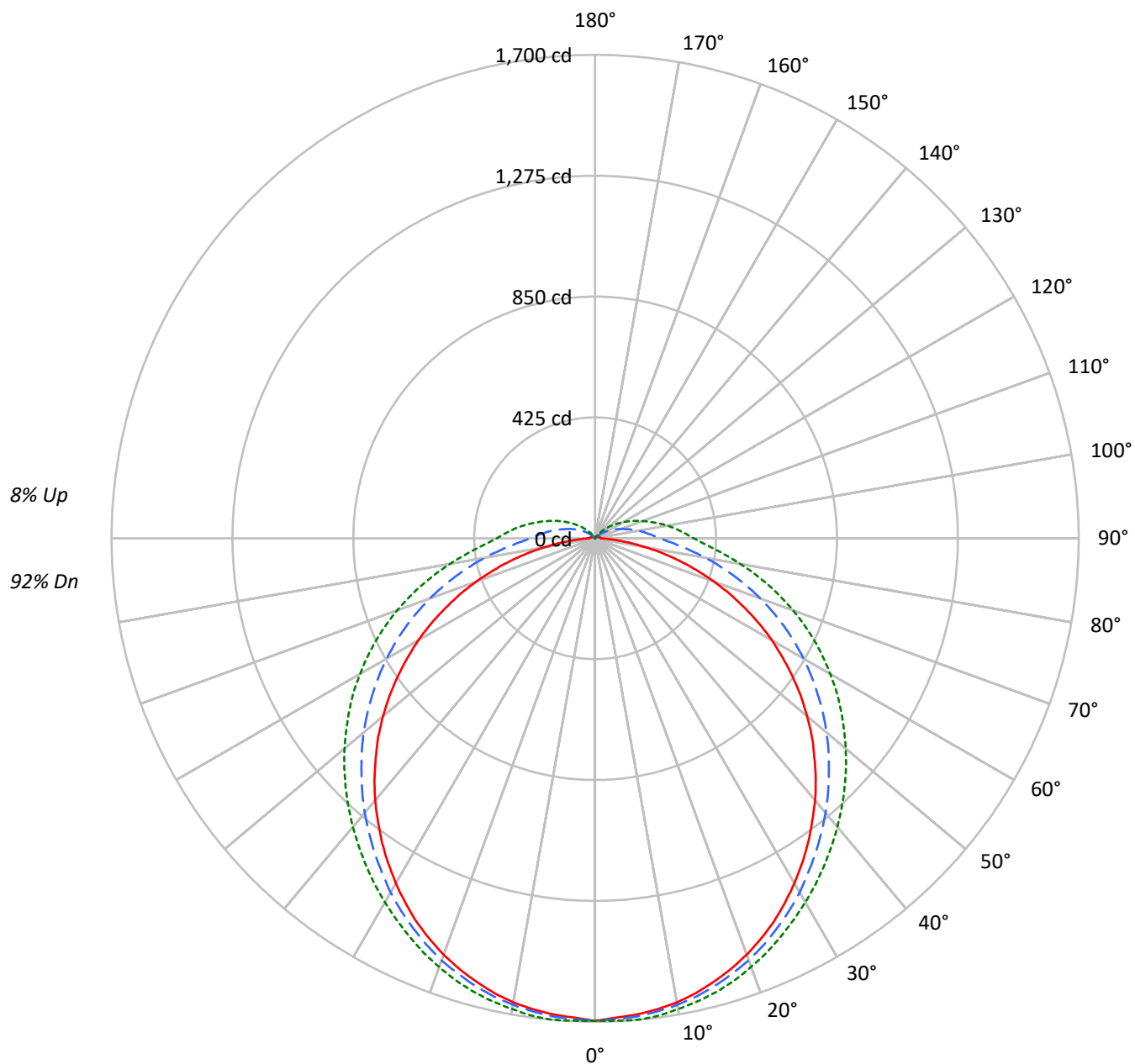
Lumens per Lamp: N/A  
Luminaire Lumens: 5910.6 lumens  
Efficiency: N/A  
Efficacy: 128.8 lumens/watt  
Spacing Criteria (0/90/45): 1.23 / 1.3 / 1.39  
Luminous Opening: Rectangular w/ Sides (W: 0.33' x L: 4' x H: 0.08')  
CIE Type: Direct

Input Watts (W): 45.9  
Input Voltage (V): 277  
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

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CATALOG NUMBER: 4APVTLD-SL3C3 HI POWER 3500K 277V

### Luminous Intensity Polar Plot





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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 |
| RCR |     |     |     |     |  |     |     |     |     |  |     |     |     |  |     |     |     |  |    |    |    |
| 0   | 117 | 117 | 117 | 117 |  | 114 | 114 | 114 | 114 |  | 107 | 107 | 107 |  | 101 | 101 | 101 |  | 95 | 95 | 95 |
| 1   | 105 | 100 | 95  | 90  |  | 102 | 97  | 92  | 88  |  | 91  | 87  | 84  |  | 86  | 83  | 80  |  | 81 | 79 | 76 |
| 2   | 95  | 86  | 78  | 72  |  | 92  | 83  | 76  | 71  |  | 79  | 73  | 68  |  | 74  | 69  | 65  |  | 70 | 66 | 63 |
| 3   | 86  | 75  | 66  | 59  |  | 83  | 73  | 65  | 58  |  | 69  | 62  | 56  |  | 65  | 59  | 54  |  | 61 | 56 | 52 |
| 4   | 79  | 66  | 57  | 50  |  | 76  | 64  | 56  | 49  |  | 61  | 53  | 47  |  | 57  | 51  | 46  |  | 54 | 49 | 45 |
| 5   | 72  | 59  | 49  | 42  |  | 69  | 57  | 48  | 42  |  | 54  | 47  | 41  |  | 51  | 45  | 40  |  | 49 | 43 | 38 |
| 6   | 67  | 53  | 44  | 37  |  | 64  | 51  | 43  | 36  |  | 49  | 41  | 35  |  | 46  | 40  | 35  |  | 44 | 38 | 34 |
| 7   | 62  | 48  | 39  | 32  |  | 59  | 47  | 38  | 32  |  | 44  | 37  | 31  |  | 42  | 36  | 31  |  | 40 | 34 | 30 |
| 8   | 57  | 43  | 35  | 29  |  | 55  | 42  | 34  | 28  |  | 40  | 33  | 28  |  | 39  | 32  | 27  |  | 37 | 31 | 27 |
| 9   | 54  | 40  | 31  | 26  |  | 52  | 39  | 31  | 26  |  | 37  | 30  | 25  |  | 36  | 29  | 24  |  | 34 | 28 | 24 |
| 10  | 50  | 37  | 29  | 23  |  | 48  | 36  | 28  | 23  |  | 34  | 27  | 23  |  | 33  | 27  | 22  |  | 32 | 26 | 22 |

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

|     | 0°    | 45°   | 90°   |
|-----|-------|-------|-------|
| 0°  | 13700 | 13700 | 13700 |
| 5°  | 13598 | 13454 | 13482 |
| 10° | 13534 | 13211 | 13198 |
| 15° | 13414 | 12950 | 12932 |
| 20° | 13284 | 12681 | 12631 |
| 25° | 13118 | 12372 | 12325 |
| 30° | 12905 | 12070 | 12040 |
| 35° | 12686 | 11740 | 11775 |
| 40° | 12460 | 11440 | 11542 |
| 45° | 12190 | 11134 | 11326 |
| 50° | 11924 | 10859 | 11128 |
| 55° | 11577 | 10555 | 10942 |
| 60° | 11189 | 10257 | 10749 |
| 65° | 10624 | 9926  | 10570 |
| 70° | 9890  | 9558  | 10355 |
| 75° | 8914  | 9132  | 10134 |
| 80° | 7359  | 8758  | 9960  |
| 85° | 5386  | 8598  | 10037 |



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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 160.8  | 2.7       |
| 10°-20°   | 461.0  | 7.8       |
| 20°-30°   | 699.2  | 11.8      |
| 30°-40°   | 848.4  | 14.4      |
| 40°-50°   | 900.1  | 15.2      |
| 50°-60°   | 854.0  | 14.4      |
| 60°-70°   | 718.8  | 12.2      |
| 70°-80°   | 517.1  | 8.7       |
| 80°-90°   | 306.8  | 5.2       |
| 90°-100°  | 191.4  | 3.2       |
| 100°-110° | 124.6  | 2.1       |
| 110°-120° | 72.8   | 1.2       |
| 120°-130° | 36.4   | 0.6       |
| 130°-140° | 13.5   | 0.2       |
| 140°-150° | 3.8    | 0.1       |
| 150°-160° | 1.8    | 0.0       |
| 160°-170° | 0.1    | 0.0       |
| 170°-180° | 0.0    | 0.0       |
| <hr/>     |        |           |
| 0°-30°    | 1321.0 | 22.3      |
| 0°-40°    | 2169.4 | 36.7      |
| 0°-60°    | 3923.5 | 66.4      |
| 0°-90°    | 5466.2 | 92.5      |
| 90°-120°  | 388.7  | 6.6       |
| 90°-150°  | 442.5  | 7.5       |
| 90°-180°  | 444.0  | 7.5       |
| 0°-180°   | 5910.6 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|------|------|-------|------|-------|------|------|
| 0°   | 1697 | 1697  | 1697 | 1697  | 1697 |      |
| 5°   | 1681 | 1701  | 1688 | 1688  | 1700 | 160  |
| 15°  | 1614 | 1635  | 1629 | 1637  | 1651 | 455  |
| 25°  | 1487 | 1508  | 1513 | 1530  | 1545 | 685  |
| 35°  | 1306 | 1332  | 1351 | 1383  | 1404 | 817  |
| 45°  | 1090 | 1123  | 1162 | 1214  | 1240 | 842  |
| 55°  | 847  | 890   | 955  | 1023  | 1055 | 757  |
| 65°  | 581  | 641   | 733  | 816   | 850  | 575  |
| 75°  | 308  | 390   | 502  | 593   | 628  | 326  |
| 85°  | 72   | 173   | 296  | 387   | 418  | 82   |
| 90°  | 22   | 110   | 227  | 315   | 346  | 14   |
| 95°  | 19   | 81    | 187  | 270   | 300  | 15   |
| 105° | 15   | 42    | 122  | 189   | 214  | 16   |
| 115° | 11   | 17    | 72   | 123   | 144  | 11   |
| 125° | 8    | 9     | 34   | 70    | 86   | 7    |
| 135° | 5    | 6     | 8    | 29    | 40   | 4    |
| 145° | 4    | 4     | 5    | 7     | 8    | 3    |
| 155° | 4    | 3     | 4    | 4     | 5    | 2    |
| 165° | 0    | 0     | 0    | 0     | 0    | 0    |
| 175° | 0    | 0     | 0    | 0     | 0    | 0    |
| 180° | 0    | 0     | 0    | 0     | 0    |      |



TEST NUMBER: P861184

CATALOG NUMBER: 4APVTLD-SL3C3 HI POWER 3500K 277V

**CANDELA DISTRIBUTION (FULL):**

|        | 0°   | 22.5° | 45°  | 67.5° | 90°  |
|--------|------|-------|------|-------|------|
| 0°     | 1697 | 1697  | 1697 | 1697  | 1697 |
| 2.5°   | 1687 | 1706  | 1692 | 1693  | 1698 |
| 5°     | 1681 | 1701  | 1688 | 1688  | 1700 |
| 7.5°   | 1671 | 1691  | 1678 | 1680  | 1694 |
| 10°    | 1657 | 1676  | 1666 | 1668  | 1681 |
| 12.5°  | 1638 | 1657  | 1650 | 1653  | 1668 |
| 15°    | 1614 | 1635  | 1629 | 1637  | 1651 |
| 17.5°  | 1588 | 1609  | 1605 | 1617  | 1630 |
| 20°    | 1558 | 1579  | 1579 | 1589  | 1604 |
| 22.5°  | 1524 | 1545  | 1548 | 1560  | 1577 |
| 25°    | 1487 | 1508  | 1513 | 1530  | 1545 |
| 27.5°  | 1445 | 1469  | 1477 | 1496  | 1512 |
| 30°    | 1401 | 1425  | 1438 | 1460  | 1478 |
| 32.5°  | 1354 | 1380  | 1394 | 1422  | 1442 |
| 35°    | 1306 | 1332  | 1351 | 1383  | 1404 |
| 37.5°  | 1254 | 1282  | 1306 | 1343  | 1365 |
| 40°    | 1203 | 1230  | 1260 | 1300  | 1325 |
| 42.5°  | 1148 | 1177  | 1212 | 1258  | 1283 |
| 45°    | 1090 | 1123  | 1162 | 1214  | 1240 |
| 47.5°  | 1034 | 1065  | 1113 | 1168  | 1196 |
| 50°    | 973  | 1007  | 1062 | 1121  | 1150 |
| 52.5°  | 911  | 949   | 1009 | 1074  | 1102 |
| 55°    | 847  | 890   | 955  | 1023  | 1055 |
| 57.5°  | 782  | 828   | 901  | 973   | 1007 |
| 60°    | 718  | 764   | 846  | 922   | 954  |
| 62.5°  | 651  | 703   | 790  | 868   | 903  |
| 65°    | 581  | 641   | 733  | 816   | 850  |
| 67.5°  | 513  | 578   | 675  | 761   | 795  |
| 70°    | 443  | 514   | 618  | 705   | 740  |
| 72.5°  | 375  | 453   | 560  | 650   | 684  |
| 75°    | 308  | 390   | 502  | 593   | 628  |
| 77.5°  | 243  | 331   | 446  | 540   | 573  |
| 80°    | 177  | 274   | 393  | 486   | 518  |
| 82.5°  | 121  | 220   | 342  | 434   | 466  |
| 85°    | 72   | 173   | 296  | 387   | 418  |
| 87.5°  | 37   | 135   | 257  | 345   | 377  |
| 90°    | 22   | 110   | 227  | 315   | 346  |
| 92.5°  | 20   | 95    | 206  | 293   | 322  |
| 95°    | 19   | 81    | 187  | 270   | 300  |
| 97.5°  | 17   | 69    | 170  | 250   | 278  |
| 100°   | 16   | 59    | 153  | 228   | 257  |
| 102.5° | 16   | 50    | 137  | 208   | 236  |
| 105°   | 15   | 42    | 122  | 189   | 214  |



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**CANDELA DISTRIBUTION (continued):**

|        | 0° | 22.5° | 45° | 67.5° | 90° |
|--------|----|-------|-----|-------|-----|
| 112.5° | 12 | 22    | 84  | 138   | 160 |
| 115°   | 11 | 17    | 72  | 123   | 144 |
| 117.5° | 11 | 13    | 62  | 109   | 128 |
| 120°   | 10 | 11    | 52  | 95    | 113 |
| 122.5° | 9  | 10    | 43  | 82    | 99  |
| 125°   | 8  | 9     | 34  | 70    | 86  |
| 127.5° | 6  | 8     | 26  | 59    | 73  |
| 130°   | 5  | 7     | 19  | 48    | 61  |
| 132.5° | 5  | 7     | 13  | 39    | 50  |
| 135°   | 5  | 6     | 8   | 29    | 40  |
| 137.5° | 5  | 5     | 7   | 21    | 30  |
| 140°   | 4  | 5     | 6   | 14    | 21  |
| 142.5° | 4  | 4     | 6   | 8     | 13  |
| 145°   | 4  | 4     | 5   | 7     | 8   |
| 147.5° | 4  | 4     | 5   | 6     | 6   |
| 150°   | 4  | 3     | 4   | 6     | 6   |
| 152.5° | 4  | 3     | 4   | 5     | 5   |
| 155°   | 4  | 3     | 4   | 4     | 5   |
| 157.5° | 4  | 3     | 3   | 4     | 4   |
| 160°   | 4  | 3     | 3   | 3     | 4   |
| 162.5° | 0  | 0     | 0   | 0     | 0   |
| 165°   | 0  | 0     | 0   | 0     | 0   |
| 167.5° | 0  | 0     | 0   | 0     | 0   |
| 170°   | 0  | 0     | 0   | 0     | 0   |
| 172.5° | 0  | 0     | 0   | 0     | 0   |
| 175°   | 0  | 0     | 0   | 0     | 0   |
| 177.5° | 0  | 0     | 0   | 0     | 0   |
| 180°   | 0  | 0     | 0   | 0     | 0   |



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







|        |    |    |     |     |     |
|--------|----|----|-----|-----|-----|
| 107.5° | 14 | 34 | 108 | 171 | 196 |
| 110°   | 13 | 28 | 96  | 154 | 177 |



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: SP1-2210-820-6

Test Date: 11/10/2022

Luminaire Tested: 4APVTLD-SL3C3

Data in this report applies to families of products including 4APVTLD-SL3C3.

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2210-820-6  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 11/10/2022  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: METALUX  
 Catalog Number: **4APVTLD-SL3C3**  
 Description: METALUX

0.1699(@277V) [AT MAX POWER AND 5000K]

### Spectral Parameters

CCT (K): 3408  
 CIE  $u'$ : 0.2372  
 CIE  $v'$ : 0.5156  
 Duv: 0.0019  
 CIE x: 0.4126  
 CIE y: 0.3987  
 CIE z: 0.1887  
 Peak Wavelength (nm): 601  
 Dominant Wavelength (nm): 580  
 Purity: 43.7

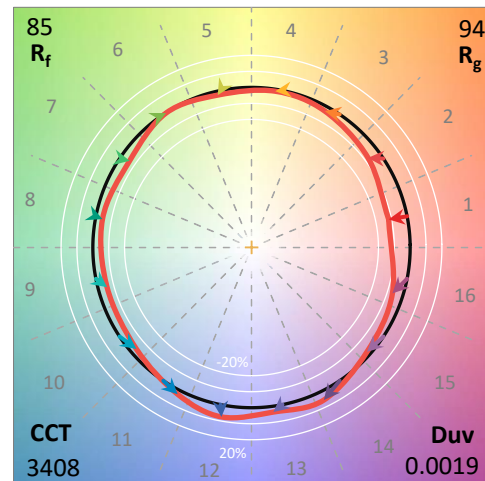
CRI (Ra): 83.5  
 R1: 81.8  
 R2: 91.2  
 R3: 96.7  
 R4: 81.5  
 R5: 81.9  
 R6: 88.8  
 R7: 84.5  
 R8: 61.7

R9: 8.7  
 R10: 79.8  
 R11: 80.9  
 R12: 67.5  
 R13: 84.2  
 R14: 98.7

Rf: 85.3  
 Rg: 94.4

### Test Conditions

Stabilization Time: 49M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.0/40%  
 Sphere Temperature (°C): 24.6

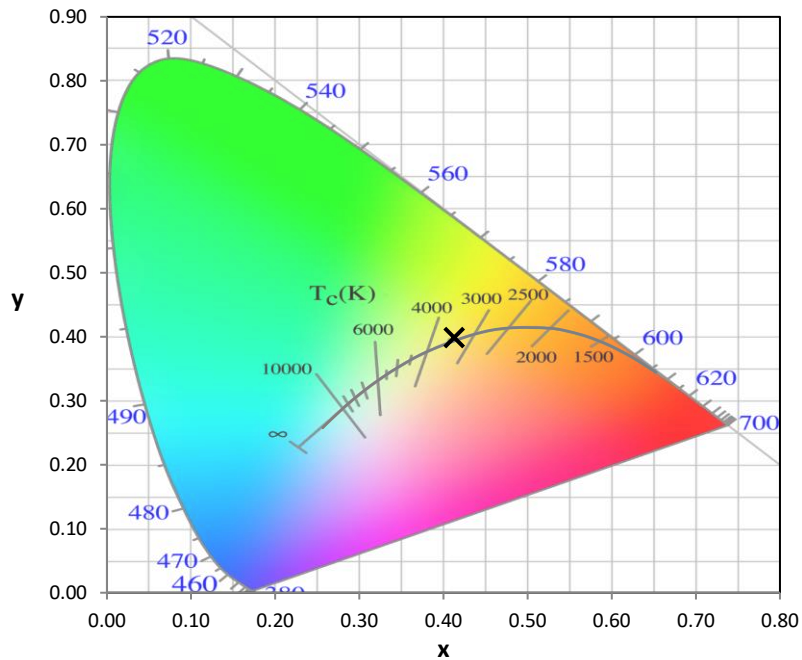


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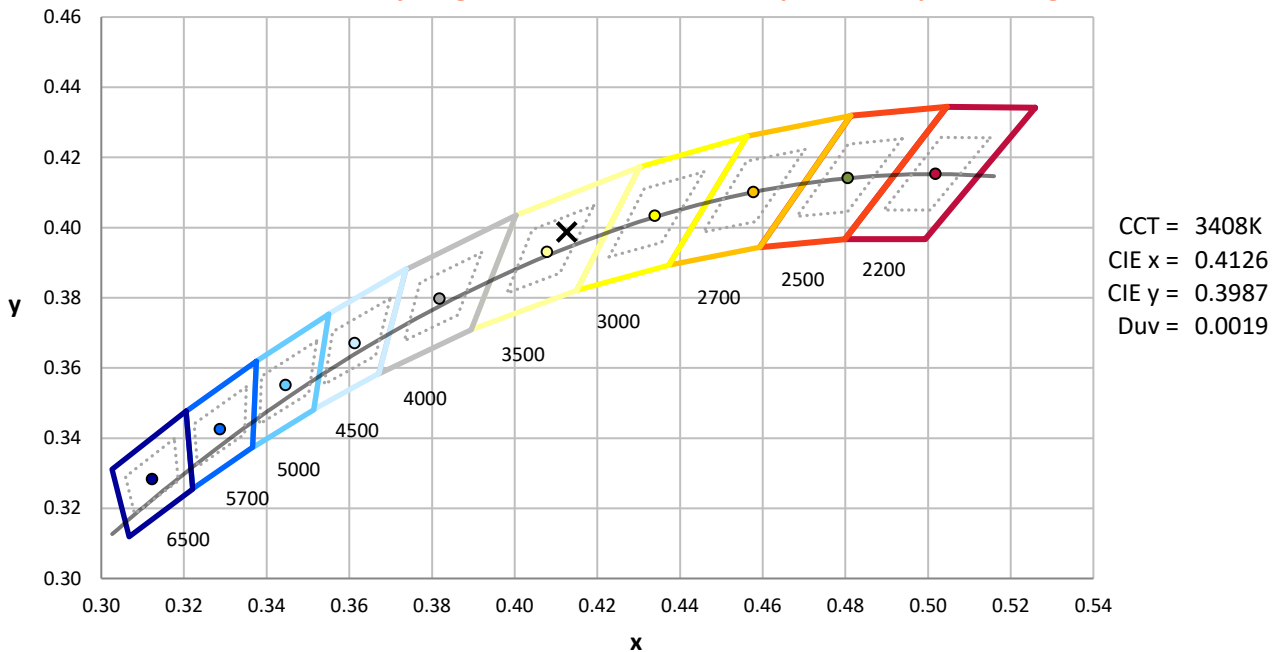
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date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



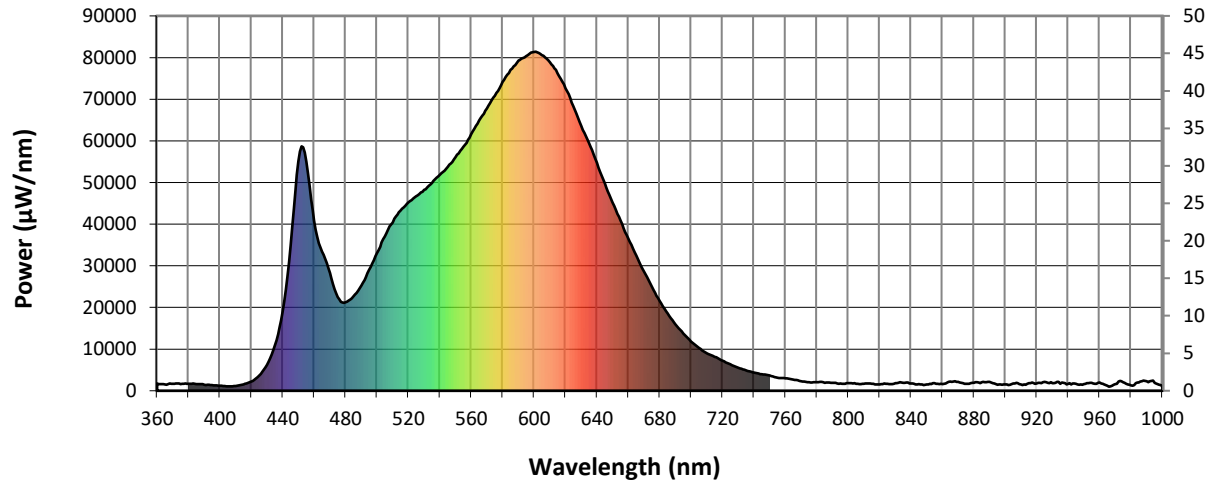
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 3500K 4-step quadrangle

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**Photopic Flux vs. Wavelength**

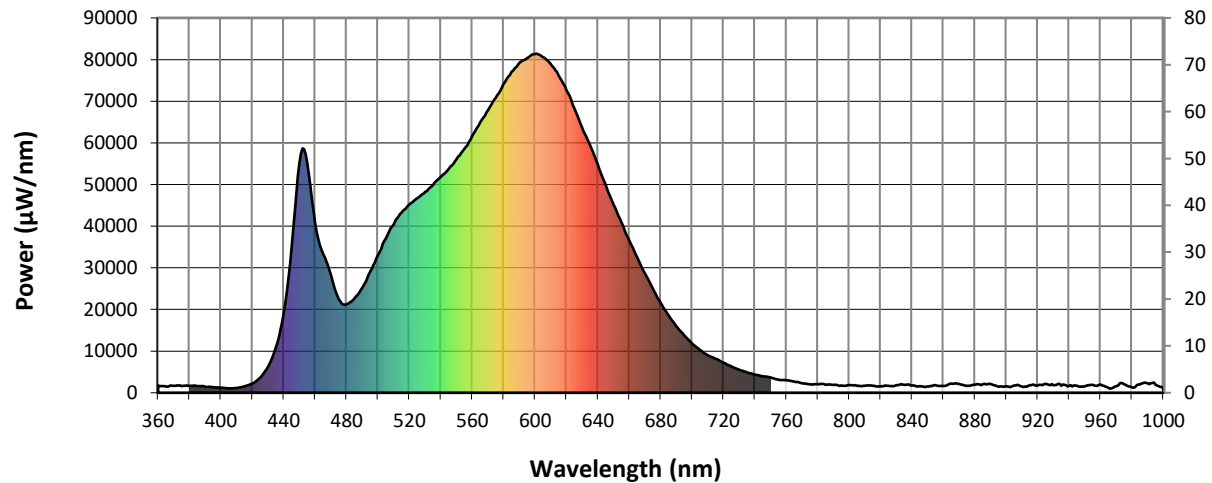


#####

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1712             | NR               | 490       | 25279            | NR               | 620       | 72559            | NR               | 750       | 3648             | NR               | 880       | 1885             | NR               |
| 365       | 1481             | NR               | 495       | 28999            | NR               | 625       | 68344            | NR               | 755       | 3136             | NR               | 885       | 2021             | NR               |
| 370       | 1644             | NR               | 500       | 33056            | NR               | 630       | 63583            | NR               | 760       | 2998             | NR               | 890       | 2108             | NR               |
| 375       | 1623             | NR               | 505       | 37033            | NR               | 635       | 59493            | NR               | 765       | 2676             | NR               | 895       | 1427             | NR               |
| 380       | 1645             | NR               | 510       | 40418            | NR               | 640       | 54727            | NR               | 770       | 2297             | NR               | 900       | 1507             | NR               |
| 385       | 1621             | NR               | 515       | 43259            | NR               | 645       | 49751            | NR               | 775       | 2015             | NR               | 905       | 1745             | NR               |
| 390       | 1416             | NR               | 520       | 45270            | NR               | 650       | 45175            | NR               | 780       | 2057             | NR               | 910       | 1518             | NR               |
| 395       | 1335             | NR               | 525       | 46700            | NR               | 655       | 40856            | NR               | 785       | 1931             | NR               | 915       | 1797             | NR               |
| 400       | 1171             | NR               | 530       | 48195            | NR               | 660       | 36522            | NR               | 790       | 1888             | NR               | 920       | 1751             | NR               |
| 405       | 1087             | NR               | 535       | 49899            | NR               | 665       | 32492            | NR               | 795       | 1719             | NR               | 925       | 2148             | NR               |
| 410       | 1128             | NR               | 540       | 51817            | NR               | 670       | 28639            | NR               | 800       | 1850             | NR               | 930       | 1788             | NR               |
| 415       | 1537             | NR               | 545       | 53742            | NR               | 675       | 24935            | NR               | 805       | 1695             | NR               | 935       | 1669             | NR               |
| 420       | 2184             | NR               | 550       | 56068            | NR               | 680       | 21545            | NR               | 810       | 1670             | NR               | 940       | 1689             | NR               |
| 425       | 3633             | NR               | 555       | 58585            | NR               | 685       | 18549            | NR               | 815       | 1706             | NR               | 945       | 1665             | NR               |
| 430       | 6234             | NR               | 560       | 61564            | NR               | 690       | 15988            | NR               | 820       | 1546             | NR               | 950       | 1581             | NR               |
| 435       | 10932            | NR               | 565       | 64869            | NR               | 695       | 13736            | NR               | 825       | 1698             | NR               | 955       | 1871             | NR               |
| 440       | 19071            | NR               | 570       | 67781            | NR               | 700       | 11828            | NR               | 830       | 1806             | NR               | 960       | 1959             | NR               |
| 445       | 34944            | NR               | 575       | 70790            | NR               | 705       | 10309            | NR               | 835       | 1898             | NR               | 965       | 1234             | NR               |
| 450       | 55079            | NR               | 580       | 74093            | NR               | 710       | 8996             | NR               | 840       | 1728             | NR               | 970       | 1554             | NR               |
| 455       | 55014            | NR               | 585       | 77038            | NR               | 715       | 8158             | NR               | 845       | 1560             | NR               | 975       | 2051             | NR               |
| 460       | 40875            | NR               | 590       | 79245            | NR               | 720       | 7196             | NR               | 850       | 1537             | NR               | 980       | 1293             | NR               |
| 465       | 33423            | NR               | 595       | 80333            | NR               | 725       | 6341             | NR               | 855       | 1800             | NR               | 985       | 1966             | NR               |
| 470       | 28260            | NR               | 600       | 81356            | NR               | 730       | 5528             | NR               | 860       | 1572             | NR               | 990       | 2266             | NR               |
| 475       | 22526            | NR               | 605       | 80555            | NR               | 735       | 4932             | NR               | 865       | 2177             | NR               | 995       | 1885             | NR               |
| 480       | 21265            | NR               | 610       | 78876            | NR               | 740       | 4365             | NR               | 870       | 2099             | NR               | 1000      | 1088             | NR               |
| 485       | 22618            | NR               | 615       | 76232            | NR               | 745       | 3964             | NR               | 875       | 1631             | NR               |           |                  |                  |

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**Scotopic Flux vs. Wavelength**



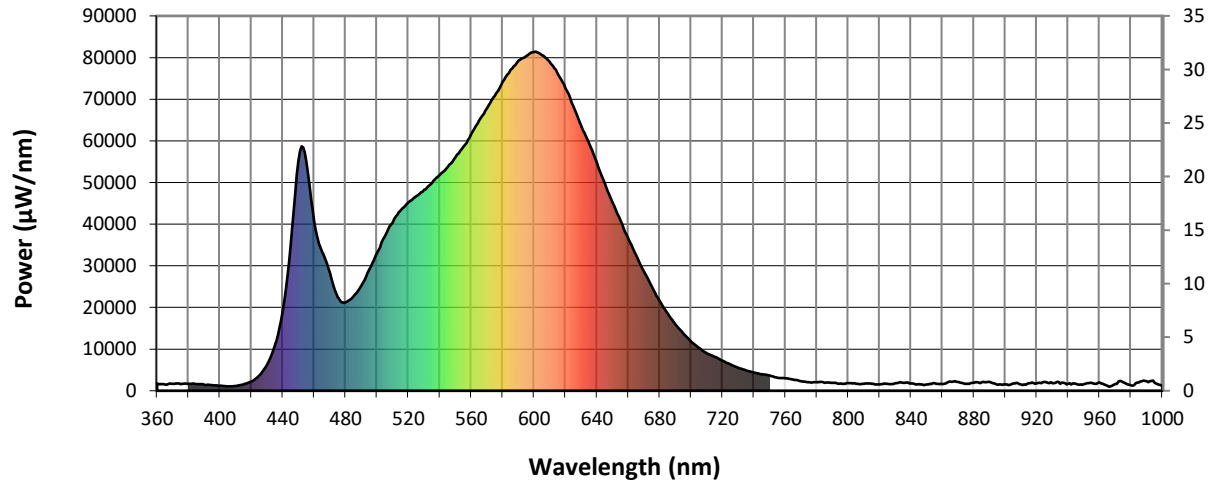
**Scotopic Lumens: 6512.6**

**S/P: 1.52**

| 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       | 1712             | NR               | 490       | 25279            | NR               | 620       | 72559            | NR               | 750       | 3648             | NR               | 880       | 1885             | NR               |
| 365       | 1481             | NR               | 495       | 28999            | NR               | 625       | 68344            | NR               | 755       | 3136             | NR               | 885       | 2021             | NR               |
| 370       | 1644             | NR               | 500       | 33056            | NR               | 630       | 63583            | NR               | 760       | 2998             | NR               | 890       | 2108             | NR               |
| 375       | 1623             | NR               | 505       | 37033            | NR               | 635       | 59493            | NR               | 765       | 2676             | NR               | 895       | 1427             | NR               |
| 380       | 1645             | NR               | 510       | 40418            | NR               | 640       | 54727            | NR               | 770       | 2297             | NR               | 900       | 1507             | NR               |
| 385       | 1621             | NR               | 515       | 43259            | NR               | 645       | 49751            | NR               | 775       | 2015             | NR               | 905       | 1745             | NR               |
| 390       | 1416             | NR               | 520       | 45270            | NR               | 650       | 45175            | NR               | 780       | 2057             | NR               | 910       | 1518             | NR               |
| 395       | 1335             | NR               | 525       | 46700            | NR               | 655       | 40856            | NR               | 785       | 1931             | NR               | 915       | 1797             | NR               |
| 400       | 1171             | NR               | 530       | 48195            | NR               | 660       | 36522            | NR               | 790       | 1888             | NR               | 920       | 1751             | NR               |
| 405       | 1087             | NR               | 535       | 49899            | NR               | 665       | 32492            | NR               | 795       | 1719             | NR               | 925       | 2148             | NR               |
| 410       | 1128             | NR               | 540       | 51817            | NR               | 670       | 28639            | NR               | 800       | 1850             | NR               | 930       | 1788             | NR               |
| 415       | 1537             | NR               | 545       | 53742            | NR               | 675       | 24935            | NR               | 805       | 1695             | NR               | 935       | 1669             | NR               |
| 420       | 2184             | NR               | 550       | 56068            | NR               | 680       | 21545            | NR               | 810       | 1670             | NR               | 940       | 1689             | NR               |
| 425       | 3633             | NR               | 555       | 58585            | NR               | 685       | 18549            | NR               | 815       | 1706             | NR               | 945       | 1665             | NR               |
| 430       | 6234             | NR               | 560       | 61564            | NR               | 690       | 15988            | NR               | 820       | 1546             | NR               | 950       | 1581             | NR               |
| 435       | 10932            | NR               | 565       | 64869            | NR               | 695       | 13736            | NR               | 825       | 1698             | NR               | 955       | 1871             | NR               |
| 440       | 19071            | NR               | 570       | 67781            | NR               | 700       | 11828            | NR               | 830       | 1806             | NR               | 960       | 1959             | NR               |
| 445       | 34944            | NR               | 575       | 70790            | NR               | 705       | 10309            | NR               | 835       | 1898             | NR               | 965       | 1234             | NR               |
| 450       | 55079            | NR               | 580       | 74093            | NR               | 710       | 8996             | NR               | 840       | 1728             | NR               | 970       | 1554             | NR               |
| 455       | 55014            | NR               | 585       | 77038            | NR               | 715       | 8158             | NR               | 845       | 1560             | NR               | 975       | 2051             | NR               |
| 460       | 40875            | NR               | 590       | 79245            | NR               | 720       | 7196             | NR               | 850       | 1537             | NR               | 980       | 1293             | NR               |
| 465       | 33423            | NR               | 595       | 80333            | NR               | 725       | 6341             | NR               | 855       | 1800             | NR               | 985       | 1966             | NR               |
| 470       | 28260            | NR               | 600       | 81356            | NR               | 730       | 5528             | NR               | 860       | 1572             | NR               | 990       | 2266             | NR               |
| 475       | 22526            | NR               | 605       | 80555            | NR               | 735       | 4932             | NR               | 865       | 2177             | NR               | 995       | 1885             | NR               |
| 480       | 21265            | NR               | 610       | 78876            | NR               | 740       | 4365             | NR               | 870       | 2099             | NR               | 1000      | 1088             | NR               |
| 485       | 22618            | NR               | 615       | 76232            | NR               | 745       | 3964             | NR               | 875       | 1631             | NR               |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 2558.7 S/P: 0.6**

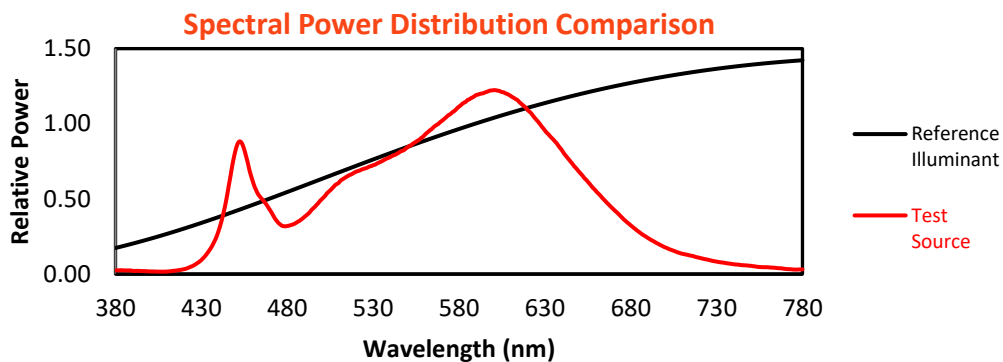
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1712             | NR               | 490       | 25279            | NR               | 620       | 72559            | NR               | 750       | 3648             | NR               | 880       | 1885             | NR               |
| 365       | 1481             | NR               | 495       | 28999            | NR               | 625       | 68344            | NR               | 755       | 3136             | NR               | 885       | 2021             | NR               |
| 370       | 1644             | NR               | 500       | 33056            | NR               | 630       | 63583            | NR               | 760       | 2998             | NR               | 890       | 2108             | NR               |
| 375       | 1623             | NR               | 505       | 37033            | NR               | 635       | 59493            | NR               | 765       | 2676             | NR               | 895       | 1427             | NR               |
| 380       | 1645             | NR               | 510       | 40418            | NR               | 640       | 54727            | NR               | 770       | 2297             | NR               | 900       | 1507             | NR               |
| 385       | 1621             | NR               | 515       | 43259            | NR               | 645       | 49751            | NR               | 775       | 2015             | NR               | 905       | 1745             | NR               |
| 390       | 1416             | NR               | 520       | 45270            | NR               | 650       | 45175            | NR               | 780       | 2057             | NR               | 910       | 1518             | NR               |
| 395       | 1335             | NR               | 525       | 46700            | NR               | 655       | 40856            | NR               | 785       | 1931             | NR               | 915       | 1797             | NR               |
| 400       | 1171             | NR               | 530       | 48195            | NR               | 660       | 36522            | NR               | 790       | 1888             | NR               | 920       | 1751             | NR               |
| 405       | 1087             | NR               | 535       | 49899            | NR               | 665       | 32492            | NR               | 795       | 1719             | NR               | 925       | 2148             | NR               |
| 410       | 1128             | NR               | 540       | 51817            | NR               | 670       | 28639            | NR               | 800       | 1850             | NR               | 930       | 1788             | NR               |
| 415       | 1537             | NR               | 545       | 53742            | NR               | 675       | 24935            | NR               | 805       | 1695             | NR               | 935       | 1669             | NR               |
| 420       | 2184             | NR               | 550       | 56068            | NR               | 680       | 21545            | NR               | 810       | 1670             | NR               | 940       | 1689             | NR               |
| 425       | 3633             | NR               | 555       | 58585            | NR               | 685       | 18549            | NR               | 815       | 1706             | NR               | 945       | 1665             | NR               |
| 430       | 6234             | NR               | 560       | 61564            | NR               | 690       | 15988            | NR               | 820       | 1546             | NR               | 950       | 1581             | NR               |
| 435       | 10932            | NR               | 565       | 64869            | NR               | 695       | 13736            | NR               | 825       | 1698             | NR               | 955       | 1871             | NR               |
| 440       | 19071            | NR               | 570       | 67781            | NR               | 700       | 11828            | NR               | 830       | 1806             | NR               | 960       | 1959             | NR               |
| 445       | 34944            | NR               | 575       | 70790            | NR               | 705       | 10309            | NR               | 835       | 1898             | NR               | 965       | 1234             | NR               |
| 450       | 55079            | NR               | 580       | 74093            | NR               | 710       | 8996             | NR               | 840       | 1728             | NR               | 970       | 1554             | NR               |
| 455       | 55014            | NR               | 585       | 77038            | NR               | 715       | 8158             | NR               | 845       | 1560             | NR               | 975       | 2051             | NR               |
| 460       | 40875            | NR               | 590       | 79245            | NR               | 720       | 7196             | NR               | 850       | 1537             | NR               | 980       | 1293             | NR               |
| 465       | 33423            | NR               | 595       | 80333            | NR               | 725       | 6341             | NR               | 855       | 1800             | NR               | 985       | 1966             | NR               |
| 470       | 28260            | NR               | 600       | 81356            | NR               | 730       | 5528             | NR               | 860       | 1572             | NR               | 990       | 2266             | NR               |
| 475       | 22526            | NR               | 605       | 80555            | NR               | 735       | 4932             | NR               | 865       | 2177             | NR               | 995       | 1885             | NR               |
| 480       | 21265            | NR               | 610       | 78876            | NR               | 740       | 4365             | NR               | 870       | 2099             | NR               | 1000      | 1088             | NR               |
| 485       | 22618            | NR               | 615       | 76232            | NR               | 745       | 3964             | NR               | 875       | 1631             | NR               |           |                  |                  |

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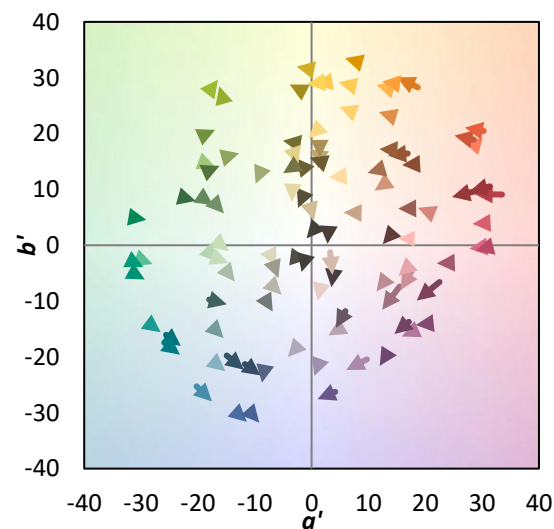
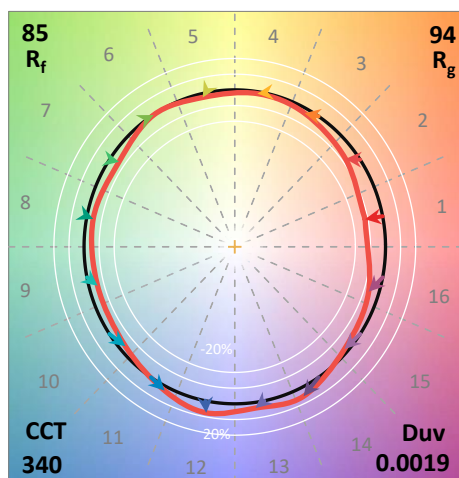
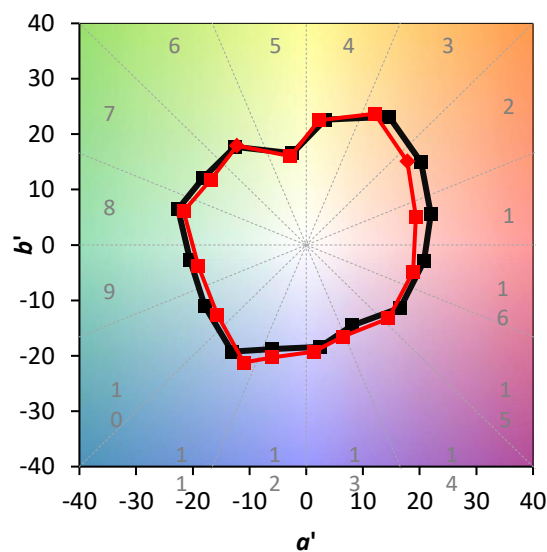
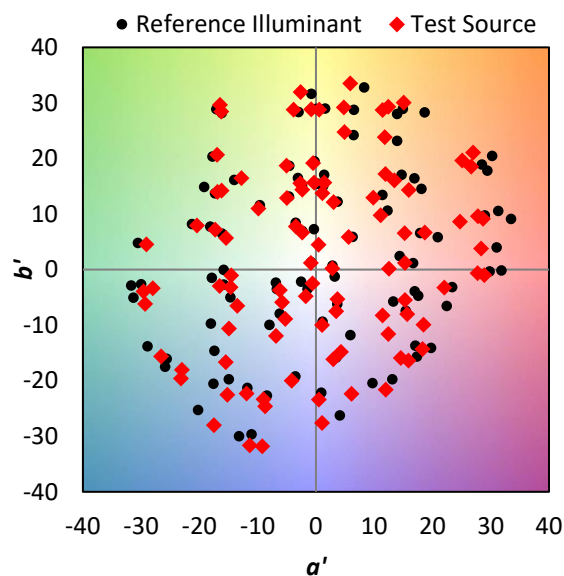
**TM-30-18**

**Summary**

$R_f = 85.3$   
 $R_g = 94.4$   
 CIE  $R_a = 83.5$   
 $R_g = 8.7$



**Color Vector Graphics**

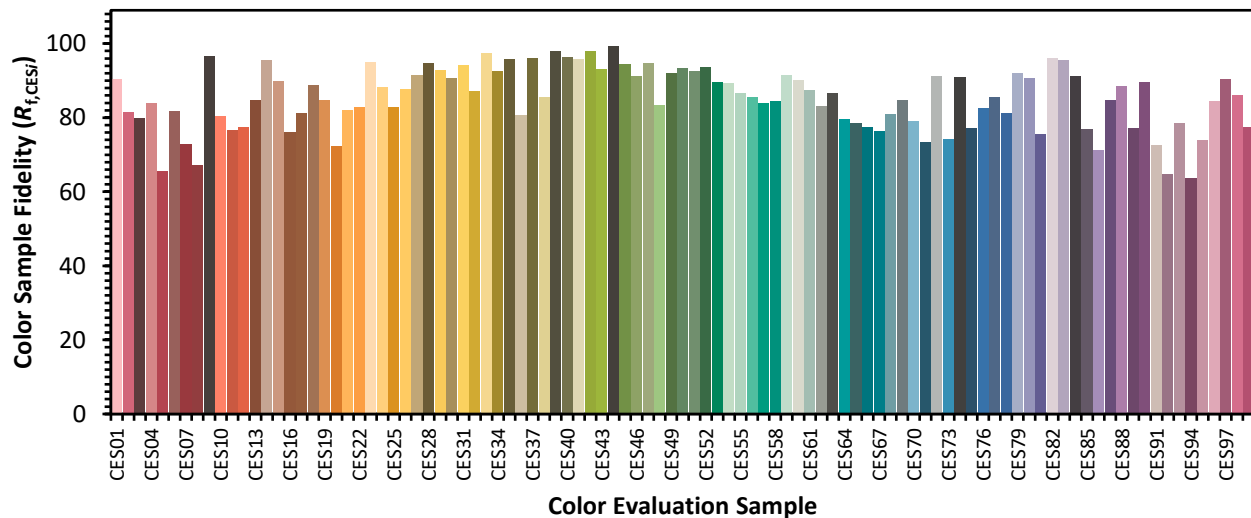


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**Individual Sample Fidelity Index ( $R_{f,i}$ )**

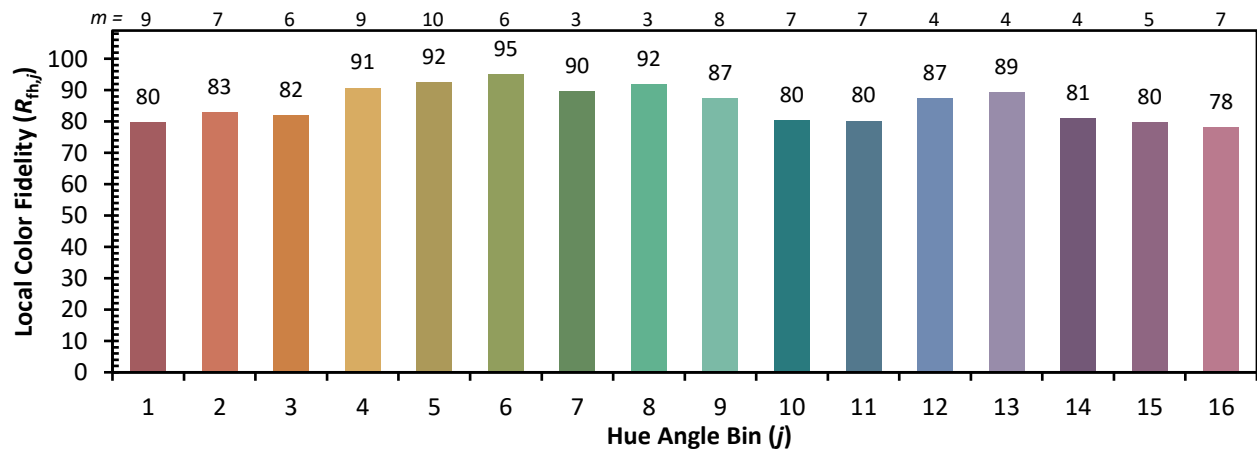
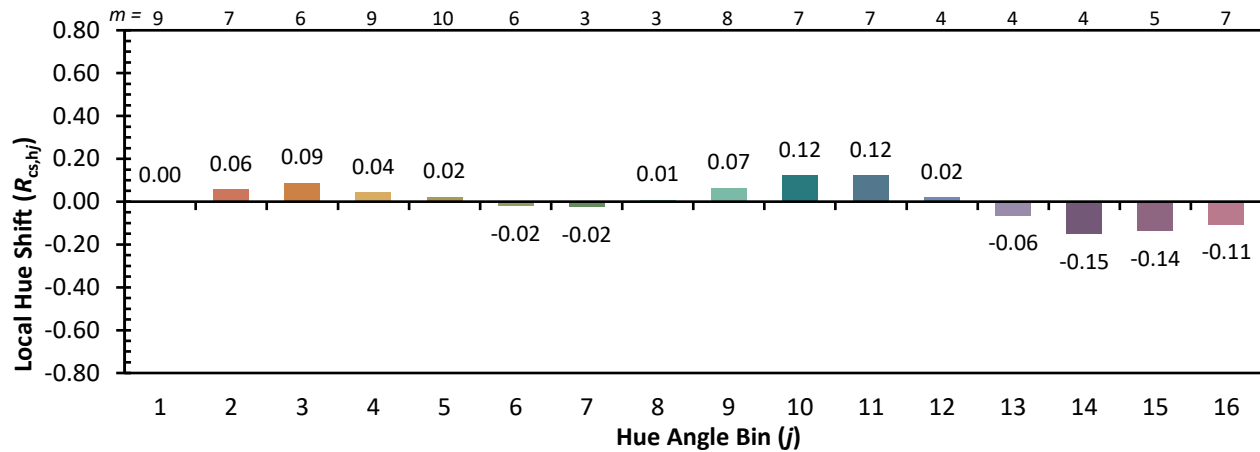
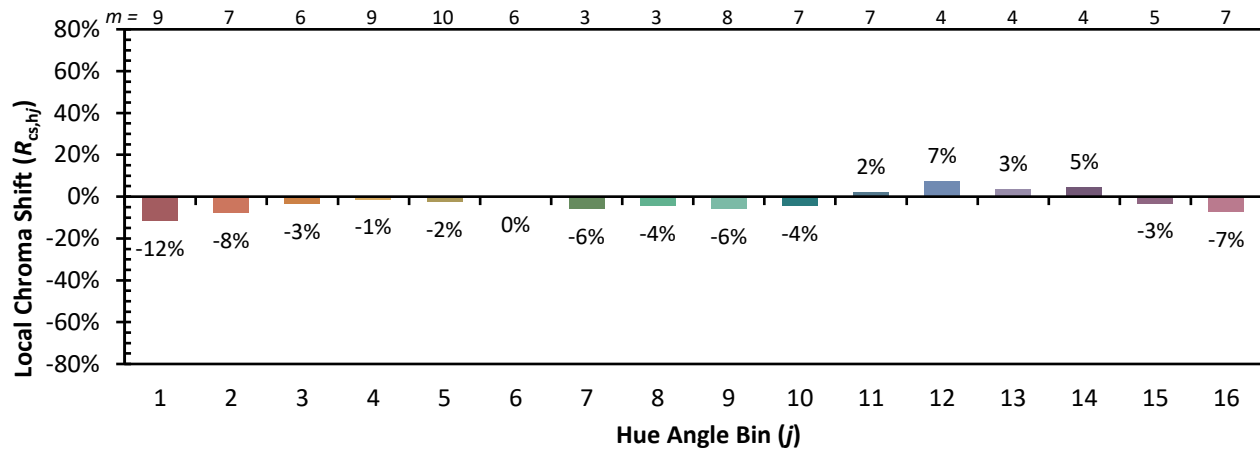
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 88 | CES51 = 93 | CES76 = 82 |
| CES02 = 62 | CES27 = 91 | CES52 = 94 | CES77 = 85 |
| CES03 = 31 | CES28 = 95 | CES53 = 90 | CES78 = 81 |
| CES04 = 70 | CES29 = 93 | CES54 = 89 | CES79 = 92 |
| CES05 = 49 | CES30 = 91 | CES55 = 87 | CES80 = 90 |
| CES06 = 51 | CES31 = 94 | CES56 = 86 | CES81 = 76 |
| CES07 = 41 | CES32 = 87 | CES57 = 84 | CES82 = 96 |
| CES08 = 40 | CES33 = 97 | CES58 = 85 | CES83 = 95 |
| CES09 = 29 | CES34 = 93 | CES59 = 91 | CES84 = 91 |
| CES10 = 75 | CES35 = 96 | CES60 = 90 | CES85 = 77 |
| CES11 = 58 | CES36 = 81 | CES61 = 87 | CES86 = 71 |
| CES12 = 64 | CES37 = 96 | CES62 = 83 | CES87 = 85 |
| CES13 = 43 | CES38 = 85 | CES63 = 87 | CES88 = 88 |
| CES14 = 74 | CES39 = 98 | CES64 = 80 | CES89 = 77 |
| CES15 = 71 | CES40 = 96 | CES65 = 78 | CES90 = 90 |
| CES16 = 47 | CES41 = 96 | CES66 = 77 | CES91 = 73 |
| CES17 = 50 | CES42 = 98 | CES67 = 76 | CES92 = 65 |
| CES18 = 56 | CES43 = 93 | CES68 = 81 | CES93 = 79 |
| CES19 = 72 | CES44 = 99 | CES69 = 85 | CES94 = 64 |
| CES20 = 66 | CES45 = 94 | CES70 = 79 | CES95 = 74 |
| CES21 = 86 | CES46 = 91 | CES71 = 73 | CES96 = 84 |
| CES22 = 78 | CES47 = 95 | CES72 = 91 | CES97 = 90 |
| CES23 = 92 | CES48 = 83 | CES73 = 74 | CES98 = 86 |
| CES24 = 90 | CES49 = 92 | CES74 = 91 | CES99 = 77 |
| CES25 = 72 | CES50 = 93 | CES75 = 77 |            |



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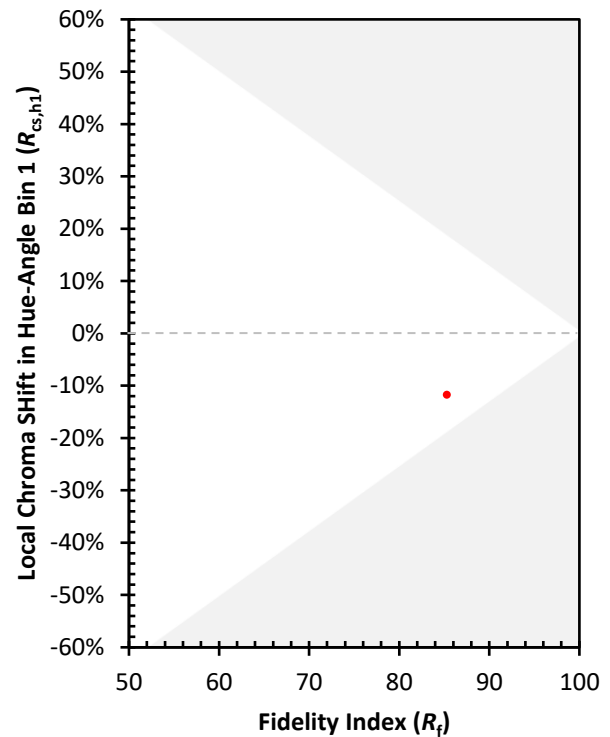
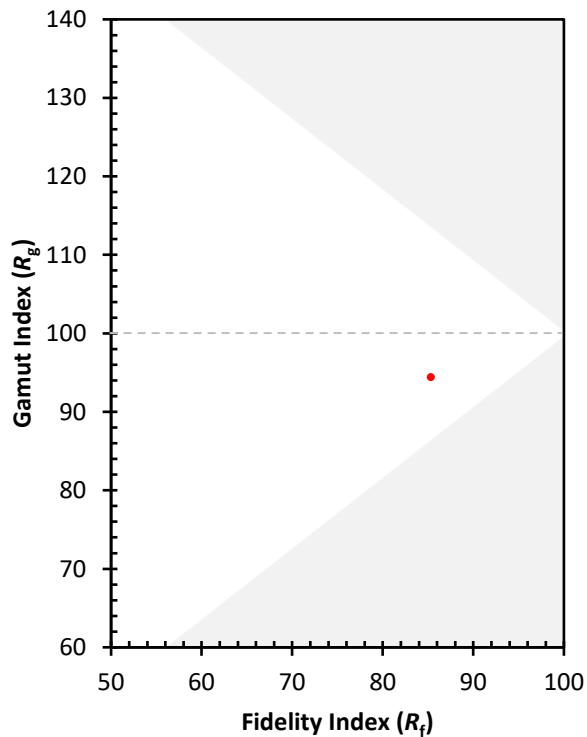
Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)