

Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
Peachtree City, GA 30269



Scaled data based on original data using  
LM-79-2019 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions

Brand: METALUX

Report Number: P983188

Luminaire Tested: 24CZ-LD5-70-UNV-L840-SQP-CD1-U

Issue Date: 04/23/2025

**Test Information**

Test Method: LM-79-2019  
Report Number: P983188  
Test Lab: INNOVATION CENTER(P3)  
Issue Date: 04/23/2025  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: METALUX  
Catalog Number: 24CZ-LD5-70-UNV-L840-SQP-CD1-U  
Description: METALUX CRUZE 2x4 7000LM PACKAGE 80CRI 4000K TROFFER LENS WITH SQUARE PATTERN  
Light Source: 4000K CCT, 80 CRI LEDS  
Ballast/Driver: -

**Summary**

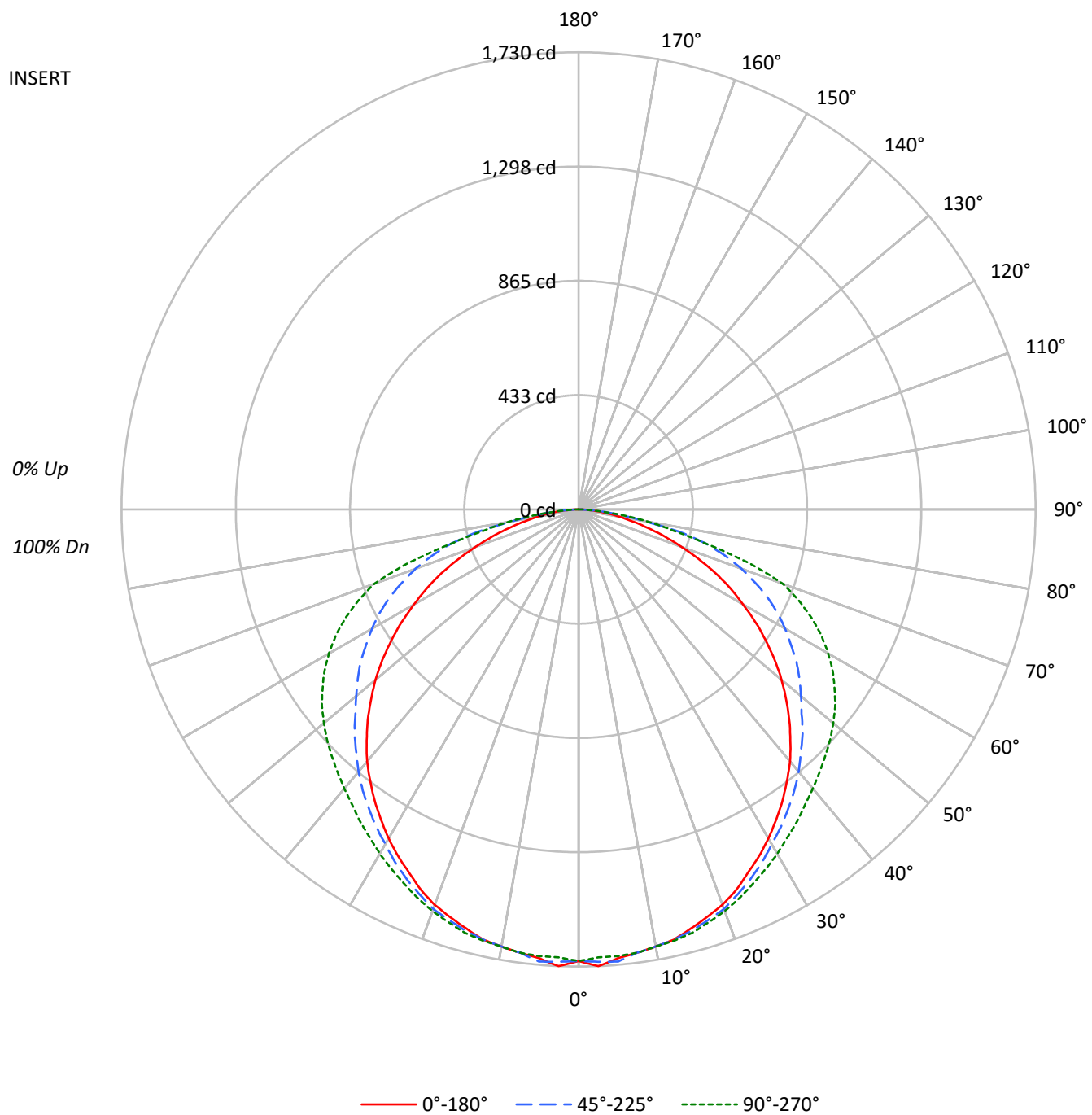
Lumens per Lamp: N/A  
Luminaire Lumens: 5381.9 lumens  
Efficiency: N/A  
Efficacy: 109.2 lumens/watt  
Spacing Criteria (0/90/45): 1.25 / 1.31 / 1.41  
Luminous Opening: Rectangular (W 2' x L: 4' x H: 0')  
CIE Type: Direct

Input Watts (W): 49.3  
Input Voltage (V): 120  
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: 28.75 FT

TEST NUMBER: P983188

CATALOG NUMBER: 24CZ-LD5-70-UNV-L840-SQP-CD1-U

### Luminous Intensity Polar Plot



TEST NUMBER: P983188

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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   | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 | 106 | 106 | 106 | 102 | 102 | 102 |
| 1   | 108 | 103 | 99  | 95  | 105 | 101 | 97  | 93  | 97  | 93  | 90  | 93  | 90  | 87  | 89  | 87  | 85  |
| 2   | 98  | 89  | 82  | 76  | 95  | 87  | 81  | 75  | 84  | 78  | 73  | 80  | 76  | 71  | 77  | 73  | 70  |
| 3   | 89  | 78  | 69  | 62  | 86  | 76  | 68  | 62  | 73  | 66  | 61  | 70  | 64  | 59  | 68  | 63  | 58  |
| 4   | 81  | 68  | 59  | 52  | 79  | 67  | 58  | 52  | 64  | 57  | 51  | 62  | 56  | 50  | 60  | 54  | 50  |
| 5   | 74  | 61  | 52  | 45  | 72  | 60  | 51  | 44  | 58  | 50  | 44  | 56  | 49  | 43  | 54  | 48  | 43  |
| 6   | 68  | 55  | 45  | 39  | 66  | 54  | 45  | 39  | 52  | 44  | 38  | 50  | 43  | 38  | 48  | 42  | 37  |
| 7   | 63  | 49  | 40  | 34  | 62  | 49  | 40  | 34  | 47  | 39  | 34  | 45  | 39  | 33  | 44  | 38  | 33  |
| 8   | 59  | 45  | 36  | 30  | 57  | 44  | 36  | 30  | 43  | 35  | 30  | 42  | 35  | 30  | 40  | 34  | 29  |
| 9   | 55  | 41  | 33  | 27  | 54  | 41  | 33  | 27  | 39  | 32  | 27  | 38  | 32  | 27  | 37  | 31  | 27  |
| 10  | 51  | 38  | 30  | 24  | 50  | 37  | 30  | 24  | 36  | 29  | 24  | 35  | 29  | 24  | 35  | 28  | 24  |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 2300 | 2300 | 2300 |
| 5°  | 2303 | 2320 | 2292 |
| 10° | 2296 | 2296 | 2296 |
| 15° | 2288 | 2300 | 2311 |
| 20° | 2280 | 2304 | 2316 |
| 25° | 2252 | 2290 | 2321 |
| 30° | 2234 | 2273 | 2338 |
| 35° | 2211 | 2272 | 2369 |
| 40° | 2188 | 2276 | 2422 |
| 45° | 2147 | 2282 | 2513 |
| 50° | 2100 | 2301 | 2633 |
| 55° | 2030 | 2363 | 2775 |
| 60° | 1934 | 2429 | 2936 |
| 65° | 1823 | 2515 | 3101 |
| 70° | 1628 | 2581 | 3239 |
| 75° | 1412 | 2585 | 2564 |
| 80° | 1198 | 1911 | 2073 |
| 85° | 1033 | 1291 | 1161 |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 90°

Vertical Angle: 70°

Luminance: 3239 cd/sqm

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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 162.3  | 3.0       |
| 10°-20°   | 466.1  | 8.7       |
| 20°-30°   | 710.3  | 13.2      |
| 30°-40°   | 869.1  | 16.1      |
| 40°-50°   | 935.1  | 17.4      |
| 50°-60°   | 905.8  | 16.8      |
| 60°-70°   | 767.4  | 14.3      |
| 70°-80°   | 463.8  | 8.6       |
| 80°-90°   | 101.9  | 1.9       |
| 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       |
| 0°-30°    | 1338.7 | 24.9      |
| 0°-40°    | 2207.8 | 41.0      |
| 0°-60°    | 4048.8 | 75.2      |
| 0°-90°    | 5381.9 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 5381.9 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|-----|------|-------|------|-------|------|------|
| 0°  | 1709 | 1709  | 1709 | 1709  | 1709 |      |
| 5°  | 1705 | 1705  | 1718 | 1709  | 1697 | 162  |
| 15° | 1643 | 1647  | 1651 | 1655  | 1659 | 464  |
| 25° | 1517 | 1526  | 1542 | 1555  | 1563 | 700  |
| 35° | 1346 | 1354  | 1383 | 1421  | 1442 | 842  |
| 45° | 1128 | 1149  | 1200 | 1275  | 1321 | 870  |
| 55° | 865  | 903   | 1007 | 1124  | 1183 | 773  |
| 65° | 573  | 635   | 790  | 915   | 974  | 564  |
| 75° | 272  | 368   | 497  | 506   | 493  | 292  |
| 85° | 67   | 80    | 84   | 80    | 75   | 76   |
| 90° | 0    | 0     | 0    | 0     | 0    |      |

TEST NUMBER: P983188

CATALOG NUMBER: 24CZ-LD5-70-UNV-L840-SQP-CD1-U

**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|-------|--------|--------|--------|--------|--------|
| 0°    | 1709.4 | 1709.4 | 1709.4 | 1709.4 | 1709.4 |
| 2.5°  | 1730.4 | 1726.2 | 1713.6 | 1705.3 | 1696.9 |
| 5°    | 1705.3 | 1705.3 | 1717.8 | 1709.4 | 1696.9 |
| 7.5°  | 1692.7 | 1692.7 | 1692.7 | 1713.6 | 1692.7 |
| 10°   | 1680.2 | 1684.4 | 1680.2 | 1696.9 | 1680.2 |
| 12.5° | 1667.6 | 1667.6 | 1667.6 | 1671.8 | 1671.8 |
| 15°   | 1642.6 | 1646.7 | 1650.9 | 1655.1 | 1659.3 |
| 17.5° | 1617.5 | 1621.7 | 1630.0 | 1634.3 | 1638.4 |
| 20°   | 1592.4 | 1596.6 | 1609.1 | 1609.1 | 1617.5 |
| 22.5° | 1559.0 | 1559.0 | 1575.7 | 1579.9 | 1592.4 |
| 25°   | 1517.2 | 1525.6 | 1542.2 | 1554.8 | 1563.1 |
| 27.5° | 1479.6 | 1487.9 | 1504.7 | 1521.3 | 1533.9 |
| 30°   | 1437.8 | 1446.1 | 1462.9 | 1487.9 | 1504.7 |
| 32.5° | 1391.8 | 1400.2 | 1425.2 | 1454.4 | 1471.2 |
| 35°   | 1345.9 | 1354.2 | 1383.4 | 1421.1 | 1442.0 |
| 37.5° | 1295.6 | 1308.2 | 1341.6 | 1383.4 | 1408.5 |
| 40°   | 1245.5 | 1258.1 | 1295.6 | 1341.6 | 1379.2 |
| 42.5° | 1187.0 | 1203.7 | 1245.5 | 1308.2 | 1350.0 |
| 45°   | 1128.5 | 1149.4 | 1199.5 | 1274.7 | 1320.7 |
| 47.5° | 1065.8 | 1086.7 | 1145.2 | 1241.3 | 1291.5 |
| 50°   | 1003.1 | 1028.1 | 1099.2 | 1203.7 | 1258.1 |
| 52.5° | 936.2  | 961.3  | 1053.2 | 1166.0 | 1224.6 |
| 55°   | 865.2  | 902.8  | 1007.2 | 1124.3 | 1182.8 |
| 57.5° | 794.1  | 836.0  | 953.0  | 1078.4 | 1141.0 |
| 60°   | 718.8  | 769.1  | 902.8  | 1028.1 | 1090.9 |
| 62.5° | 647.8  | 702.2  | 848.4  | 973.9  | 1036.6 |
| 65°   | 572.6  | 635.3  | 790.0  | 915.3  | 973.9  |
| 67.5° | 493.2  | 572.6  | 723.1  | 844.3  | 902.8  |
| 70°   | 413.8  | 505.8  | 656.2  | 769.1  | 823.4  |
| 72.5° | 342.7  | 438.9  | 580.9  | 677.0  | 677.0  |
| 75°   | 271.6  | 367.8  | 497.3  | 505.8  | 493.2  |
| 77.5° | 208.9  | 301.0  | 388.6  | 355.3  | 363.6  |
| 80°   | 154.6  | 229.8  | 246.6  | 259.2  | 267.5  |
| 82.5° | 104.5  | 154.6  | 158.8  | 167.2  | 167.2  |
| 85°   | 66.9   | 79.5   | 83.6   | 79.5   | 75.2   |
| 87.5° | 29.2   | 33.5   | 25.1   | 16.7   | 12.6   |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |

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

Report Prepared for

Cooper Lighting Solutions

Metalux

Report Number: SP3-2508-516-7

Test Date: 09/03/2025

Luminaire Tested: 24CZ-LD5-65-S-UNV-L940-CD1-U

Data in this report applies to families of products including 24CZ-LD5-65-S-UNV-L940-CD1-U

### Test Information

Test Method: LM-79-2019  
 Report Number: SP3-2508-516-7  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP3 - 3M SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 09/05/2025  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: Metalux  
 Catalog Number: **24CZ-LD5-65-S-UNV-L940-CD1-U**  
 Description: 2X4 CRUZE SB 6500LM 940 SMOOTH LENS

### Spectral Parameters

CCT (K): 3955  
 CIE  $u'$ : 0.2264  
 CIE  $v'$ : 0.5014  
 Duv: -0.0009  
 CIE x: 0.3818  
 CIE y: 0.3758  
 CIE z: 0.2424  
 Peak Wavelength (nm): 630  
 Dominant Wavelength (nm): 579  
 Purity: 27.35334  
 R<sub>f</sub>: 90.3  
 R<sub>g</sub>: 99.3

CRI (Ra): 93.6  
 R1: 95.0  
 R2: 96.2  
 R3: 95.3  
 R4: 94.7  
 R5: 93.8  
 R6: 93.5  
 R7: 94.0  
 R8: 86.7  
 R9: 65.5  
 R10: 88.9  
 R11: 94.8  
 R12: 71.7  
 R13: 95.4  
 R14: 96.7  
 R15: 92.2



### Test Conditions

Stabilization Time: 22M  
 Operation Time: 1H 22M  
 Sphere Temperature (°C): 25.0

REPORT NUMBER: SP3-2508-516-7

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | 3M SPHERE IN02505     | 7/1/2025         | 1/1/2026             |
| Power Meter                    | XITRON INXT2011006    | 1/20/2025        | 1/20/2026            |
| AC Power Source                | CHROMA 61604 IN6064A  | 10/22/2024       | 10/22/2025           |
| DC Power Source                | EYSIGHT N5770A IN0534 | 10/22/2024       | 10/22/2025           |
| Sphere Thermometer             | TANDD IN4036E         | 10/22/2024       | 10/22/2025           |
|                                |                       |                  |                      |



REPORT NUMBER: SP3-2508-516-7

### Photopic Flux vs. Wavelength



### Photopic Lumens: NR

| λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 171                      | NR            | 620    | 355                      | NR            | 750    | 8                        | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 199                      | NR            | 625    | 352                      | NR            | 755    | 7                        | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 230                      | NR            | 630    | 1000                     | NR            | 760    | 6                        | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 257                      | NR            | 635    | 711                      | NR            | 765    | 5                        | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 278                      | NR            | 640    | 235                      | NR            | 770    | 4                        | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 295                      | NR            | 645    | 222                      | NR            | 775    | 4                        | NR            | 905    | 0                        | NR            |
| 390    | 1                        | NR            | 520    | 305                      | NR            | 650    | 198                      | NR            | 780    | 3                        | NR            | 910    | 0                        | NR            |
| 395    | 2                        | NR            | 525    | 313                      | NR            | 655    | 165                      | NR            | 785    | 3                        | NR            | 915    | 0                        | NR            |
| 400    | 3                        | NR            | 530    | 318                      | NR            | 660    | 142                      | NR            | 790    | 2                        | NR            | 920    | 0                        | NR            |
| 405    | 4                        | NR            | 535    | 323                      | NR            | 665    | 120                      | NR            | 795    | 2                        | NR            | 925    | 0                        | NR            |
| 410    | 6                        | NR            | 540    | 327                      | NR            | 670    | 110                      | NR            | 800    | 2                        | NR            | 930    | 0                        | NR            |
| 415    | 9                        | NR            | 545    | 333                      | NR            | 675    | 91                       | NR            | 805    | 2                        | NR            | 935    | 0                        | NR            |
| 420    | 15                       | NR            | 550    | 339                      | NR            | 680    | 77                       | NR            | 810    | 1                        | NR            | 940    | 0                        | NR            |
| 425    | 27                       | NR            | 555    | 343                      | NR            | 685    | 67                       | NR            | 815    | 1                        | NR            | 945    | 0                        | NR            |
| 430    | 48                       | NR            | 560    | 349                      | NR            | 690    | 57                       | NR            | 820    | 1                        | NR            | 950    | 0                        | NR            |
| 435    | 87                       | NR            | 565    | 355                      | NR            | 695    | 49                       | NR            | 825    | 1                        | NR            | 955    | 0                        | NR            |
| 440    | 155                      | NR            | 570    | 358                      | NR            | 700    | 42                       | NR            | 830    | 1                        | NR            | 960    | 0                        | NR            |
| 445    | 291                      | NR            | 575    | 363                      | NR            | 705    | 36                       | NR            | 835    | 1                        | NR            | 965    | 0                        | NR            |
| 450    | 475                      | NR            | 580    | 365                      | NR            | 710    | 30                       | NR            | 840    | 1                        | NR            | 970    | 0                        | NR            |
| 455    | 466                      | NR            | 585    | 367                      | NR            | 715    | 26                       | NR            | 845    | 1                        | NR            | 975    | 0                        | NR            |
| 460    | 308                      | NR            | 590    | 367                      | NR            | 720    | 22                       | NR            | 850    | 0                        | NR            | 980    | 0                        | NR            |
| 465    | 246                      | NR            | 595    | 364                      | NR            | 725    | 19                       | NR            | 855    | 0                        | NR            | 985    | 0                        | NR            |
| 470    | 202                      | NR            | 600    | 363                      | NR            | 730    | 16                       | NR            | 860    | 0                        | NR            | 990    | 0                        | NR            |
| 475    | 152                      | NR            | 605    | 361                      | NR            | 735    | 14                       | NR            | 865    | 0                        | NR            | 995    | 0                        | NR            |
| 480    | 140                      | NR            | 610    | 391                      | NR            | 740    | 11                       | NR            | 870    | 0                        | NR            | 1000   | 0                        | NR            |
| 485    | 152                      | NR            | 615    | 418                      | NR            | 745    | 10                       | NR            | 875    | 0                        | NR            |        |                          |               |

REPORT NUMBER: SP3-2508-516-7

### Scotopic Flux vs. Wavelength



Scotopic Lumens: NR

S/P: 1.77

| $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^\wedge/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) |
|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|-------------------|--------------------------------------|--------------------------------|
| 360               | 0                                    | NR                             | 490               | 171                                  | NR                             | 620               | 355                                  | NR                             | 750               | 8                                    | NR                             | 880               | 0                                    | NR                             |
| 365               | 0                                    | NR                             | 495               | 199                                  | NR                             | 625               | 352                                  | NR                             | 755               | 7                                    | NR                             | 885               | 0                                    | NR                             |
| 370               | 0                                    | NR                             | 500               | 230                                  | NR                             | 630               | 1000                                 | NR                             | 760               | 6                                    | NR                             | 890               | 0                                    | NR                             |
| 375               | 0                                    | NR                             | 505               | 257                                  | NR                             | 635               | 711                                  | NR                             | 765               | 5                                    | NR                             | 895               | 0                                    | NR                             |
| 380               | 0                                    | NR                             | 510               | 278                                  | NR                             | 640               | 235                                  | NR                             | 770               | 4                                    | NR                             | 900               | 0                                    | NR                             |
| 385               | 0                                    | NR                             | 515               | 295                                  | NR                             | 645               | 222                                  | NR                             | 775               | 4                                    | NR                             | 905               | 0                                    | NR                             |
| 390               | 1                                    | NR                             | 520               | 305                                  | NR                             | 650               | 198                                  | NR                             | 780               | 3                                    | NR                             | 910               | 0                                    | NR                             |
| 395               | 2                                    | NR                             | 525               | 313                                  | NR                             | 655               | 165                                  | NR                             | 785               | 3                                    | NR                             | 915               | 0                                    | NR                             |
| 400               | 3                                    | NR                             | 530               | 318                                  | NR                             | 660               | 142                                  | NR                             | 790               | 2                                    | NR                             | 920               | 0                                    | NR                             |
| 405               | 4                                    | NR                             | 535               | 323                                  | NR                             | 665               | 120                                  | NR                             | 795               | 2                                    | NR                             | 925               | 0                                    | NR                             |
| 410               | 6                                    | NR                             | 540               | 327                                  | NR                             | 670               | 110                                  | NR                             | 800               | 2                                    | NR                             | 930               | 0                                    | NR                             |
| 415               | 9                                    | NR                             | 545               | 333                                  | NR                             | 675               | 91                                   | NR                             | 805               | 2                                    | NR                             | 935               | 0                                    | NR                             |
| 420               | 15                                   | NR                             | 550               | 339                                  | NR                             | 680               | 77                                   | NR                             | 810               | 1                                    | NR                             | 940               | 0                                    | NR                             |
| 425               | 27                                   | NR                             | 555               | 343                                  | NR                             | 685               | 67                                   | NR                             | 815               | 1                                    | NR                             | 945               | 0                                    | NR                             |
| 430               | 48                                   | NR                             | 560               | 349                                  | NR                             | 690               | 57                                   | NR                             | 820               | 1                                    | NR                             | 950               | 0                                    | NR                             |
| 435               | 87                                   | NR                             | 565               | 355                                  | NR                             | 695               | 49                                   | NR                             | 825               | 1                                    | NR                             | 955               | 0                                    | NR                             |
| 440               | 155                                  | NR                             | 570               | 358                                  | NR                             | 700               | 42                                   | NR                             | 830               | 1                                    | NR                             | 960               | 0                                    | NR                             |
| 445               | 291                                  | NR                             | 575               | 363                                  | NR                             | 705               | 36                                   | NR                             | 835               | 1                                    | NR                             | 965               | 0                                    | NR                             |
| 450               | 475                                  | NR                             | 580               | 365                                  | NR                             | 710               | 30                                   | NR                             | 840               | 1                                    | NR                             | 970               | 0                                    | NR                             |
| 455               | 466                                  | NR                             | 585               | 367                                  | NR                             | 715               | 26                                   | NR                             | 845               | 1                                    | NR                             | 975               | 0                                    | NR                             |
| 460               | 308                                  | NR                             | 590               | 367                                  | NR                             | 720               | 22                                   | NR                             | 850               | 0                                    | NR                             | 980               | 0                                    | NR                             |
| 465               | 246                                  | NR                             | 595               | 364                                  | NR                             | 725               | 19                                   | NR                             | 855               | 0                                    | NR                             | 985               | 0                                    | NR                             |
| 470               | 202                                  | NR                             | 600               | 363                                  | NR                             | 730               | 16                                   | NR                             | 860               | 0                                    | NR                             | 990               | 0                                    | NR                             |
| 475               | 152                                  | NR                             | 605               | 361                                  | NR                             | 735               | 14                                   | NR                             | 865               | 0                                    | NR                             | 995               | 0                                    | NR                             |
| 480               | 140                                  | NR                             | 610               | 391                                  | NR                             | 740               | 11                                   | NR                             | 870               | 0                                    | NR                             | 1000              | 0                                    | NR                             |
| 485               | 152                                  | NR                             | 615               | 418                                  | NR                             | 745               | 10                                   | NR                             | 875               | 0                                    | NR                             |                   |                                      |                                |

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### Melanopic Flux vs. Wavelength



Melanopic Lumens: NR

M/P: 3.69

| λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) |
|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|
| 360       | 0                           | NR               | 490       | 171                         | NR               | 620       | 355                         | NR               | 750       | 8                           | NR               | 880       | 0                           | NR               |
| 365       | 0                           | NR               | 495       | 199                         | NR               | 625       | 352                         | NR               | 755       | 7                           | NR               | 885       | 0                           | NR               |
| 370       | 0                           | NR               | 500       | 230                         | NR               | 630       | 1000                        | NR               | 760       | 6                           | NR               | 890       | 0                           | NR               |
| 375       | 0                           | NR               | 505       | 257                         | NR               | 635       | 711                         | NR               | 765       | 5                           | NR               | 895       | 0                           | NR               |
| 380       | 0                           | NR               | 510       | 278                         | NR               | 640       | 235                         | NR               | 770       | 4                           | NR               | 900       | 0                           | NR               |
| 385       | 0                           | NR               | 515       | 295                         | NR               | 645       | 222                         | NR               | 775       | 4                           | NR               | 905       | 0                           | NR               |
| 390       | 1                           | NR               | 520       | 305                         | NR               | 650       | 198                         | NR               | 780       | 3                           | NR               | 910       | 0                           | NR               |
| 395       | 2                           | NR               | 525       | 313                         | NR               | 655       | 165                         | NR               | 785       | 3                           | NR               | 915       | 0                           | NR               |
| 400       | 3                           | NR               | 530       | 318                         | NR               | 660       | 142                         | NR               | 790       | 2                           | NR               | 920       | 0                           | NR               |
| 405       | 4                           | NR               | 535       | 323                         | NR               | 665       | 120                         | NR               | 795       | 2                           | NR               | 925       | 0                           | NR               |
| 410       | 6                           | NR               | 540       | 327                         | NR               | 670       | 110                         | NR               | 800       | 2                           | NR               | 930       | 0                           | NR               |
| 415       | 9                           | NR               | 545       | 333                         | NR               | 675       | 91                          | NR               | 805       | 2                           | NR               | 935       | 0                           | NR               |
| 420       | 15                          | NR               | 550       | 339                         | NR               | 680       | 77                          | NR               | 810       | 1                           | NR               | 940       | 0                           | NR               |
| 425       | 27                          | NR               | 555       | 343                         | NR               | 685       | 67                          | NR               | 815       | 1                           | NR               | 945       | 0                           | NR               |
| 430       | 48                          | NR               | 560       | 349                         | NR               | 690       | 57                          | NR               | 820       | 1                           | NR               | 950       | 0                           | NR               |
| 435       | 87                          | NR               | 565       | 355                         | NR               | 695       | 49                          | NR               | 825       | 1                           | NR               | 955       | 0                           | NR               |
| 440       | 155                         | NR               | 570       | 358                         | NR               | 700       | 42                          | NR               | 830       | 1                           | NR               | 960       | 0                           | NR               |
| 445       | 291                         | NR               | 575       | 363                         | NR               | 705       | 36                          | NR               | 835       | 1                           | NR               | 965       | 0                           | NR               |
| 450       | 475                         | NR               | 580       | 365                         | NR               | 710       | 30                          | NR               | 840       | 1                           | NR               | 970       | 0                           | NR               |
| 455       | 466                         | NR               | 585       | 367                         | NR               | 715       | 26                          | NR               | 845       | 1                           | NR               | 975       | 0                           | NR               |
| 460       | 308                         | NR               | 590       | 367                         | NR               | 720       | 22                          | NR               | 850       | 0                           | NR               | 980       | 0                           | NR               |
| 465       | 246                         | NR               | 595       | 364                         | NR               | 725       | 19                          | NR               | 855       | 0                           | NR               | 985       | 0                           | NR               |
| 470       | 202                         | NR               | 600       | 363                         | NR               | 730       | 16                          | NR               | 860       | 0                           | NR               | 990       | 0                           | NR               |
| 475       | 152                         | NR               | 605       | 361                         | NR               | 735       | 14                          | NR               | 865       | 0                           | NR               | 995       | 0                           | NR               |
| 480       | 140                         | NR               | 610       | 391                         | NR               | 740       | 11                          | NR               | 870       | 0                           | NR               | 1000      | 0                           | NR               |
| 485       | 152                         | NR               | 615       | 418                         | NR               | 745       | 10                          | NR               | 875       | 0                           | NR               |           |                             |                  |

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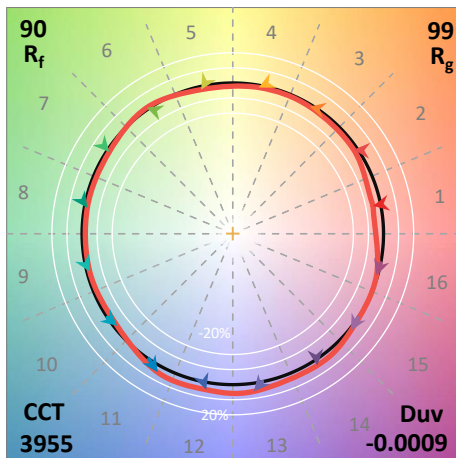
TM-30-18

### Summary

$R_f = 90.3$   
 $R_g = 99.3$   
 CIE  $R_a = 93.6$   
 $R_9 = 65.5$



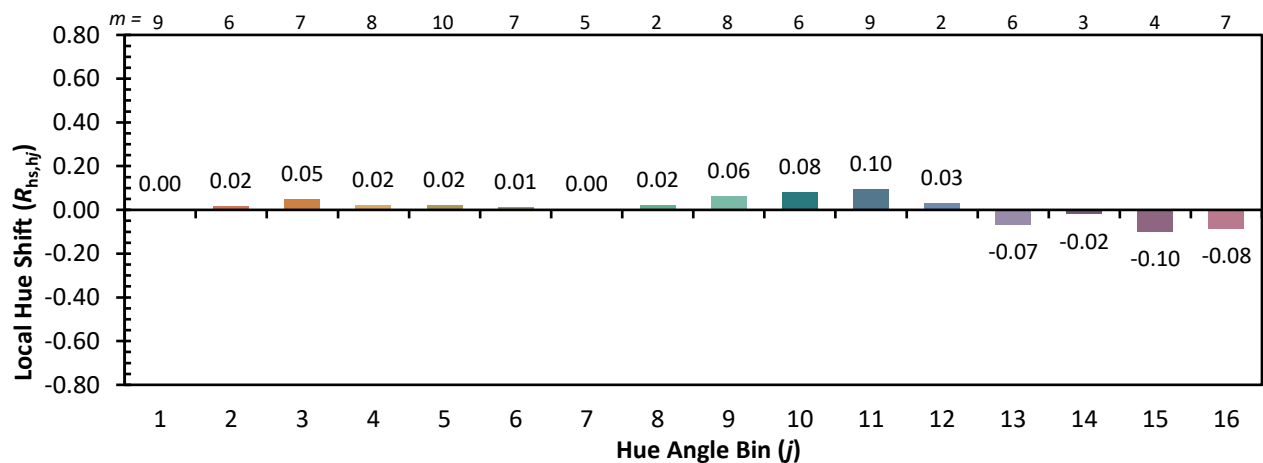
### Color Vector Graphics



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

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 93 | CES51 = 97 | CES76 = 85 |
| CES02 = 62 | CES27 = 90 | CES52 = 99 | CES77 = 87 |
| CES03 = 31 | CES28 = 95 | CES53 = 97 | CES78 = 82 |
| CES04 = 69 | CES29 = 96 | CES54 = 92 | CES79 = 93 |
| CES05 = 49 | CES30 = 89 | CES55 = 90 | CES80 = 92 |
| CES06 = 50 | CES31 = 97 | CES56 = 94 | CES81 = 80 |
| CES07 = 42 | CES32 = 89 | CES57 = 92 | CES82 = 96 |
| CES08 = 41 | CES33 = 98 | CES58 = 92 | CES83 = 96 |
| CES09 = 29 | CES34 = 93 | CES59 = 97 | CES84 = 93 |
| CES10 = 74 | CES35 = 95 | CES60 = 91 | CES85 = 80 |
| CES11 = 57 | CES36 = 77 | CES61 = 91 | CES86 = 84 |
| CES12 = 63 | CES37 = 94 | CES62 = 83 | CES87 = 91 |
| CES13 = 43 | CES38 = 83 | CES63 = 91 | CES88 = 98 |
| CES14 = 74 | CES39 = 99 | CES64 = 88 | CES89 = 85 |
| CES15 = 71 | CES40 = 98 | CES65 = 87 | CES90 = 96 |
| CES16 = 47 | CES41 = 96 | CES66 = 84 | CES91 = 70 |
| CES17 = 49 | CES42 = 92 | CES67 = 83 | CES92 = 76 |
| CES18 = 56 | CES43 = 93 | CES68 = 86 | CES93 = 85 |
| CES19 = 71 | CES44 = 99 | CES69 = 87 | CES94 = 76 |
| CES20 = 66 | CES45 = 97 | CES70 = 84 | CES95 = 81 |
| CES21 = 85 | CES46 = 97 | CES71 = 76 | CES96 = 92 |
| CES22 = 78 | CES47 = 94 | CES72 = 93 | CES97 = 95 |
| CES23 = 91 | CES48 = 89 | CES73 = 78 | CES98 = 95 |
| CES24 = 90 | CES49 = 96 | CES74 = 90 | CES99 = 93 |
| CES25 = 71 | CES50 = 98 | CES75 = 79 |            |



**Color Rendition by Hue-Angle Bin**


**Measure Comparisons**



(END OF REPORT)