

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: P982888

Luminaire Tested: 24CZ-LD5-40-UNV-L840-CD1-U

Issue Date: 04/23/2025

**Test Information**

Test Method: LM-79-2019  
Report Number: P982888  
Test Lab: INNOVATION CENTER(P3)  
Issue Date: 04/23/2025  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: METALUX  
Catalog Number: 24CZ-LD5-40-UNV-L840-CD1-U  
Description: METALUX CRUZE 2x4 4000LM PACKAGE 80CRI 4000K TROFFER STANDARD LENS  
Light Source: 4000K CCT, 80 CRI LEDS  
Ballast/Driver: -

**Summary**

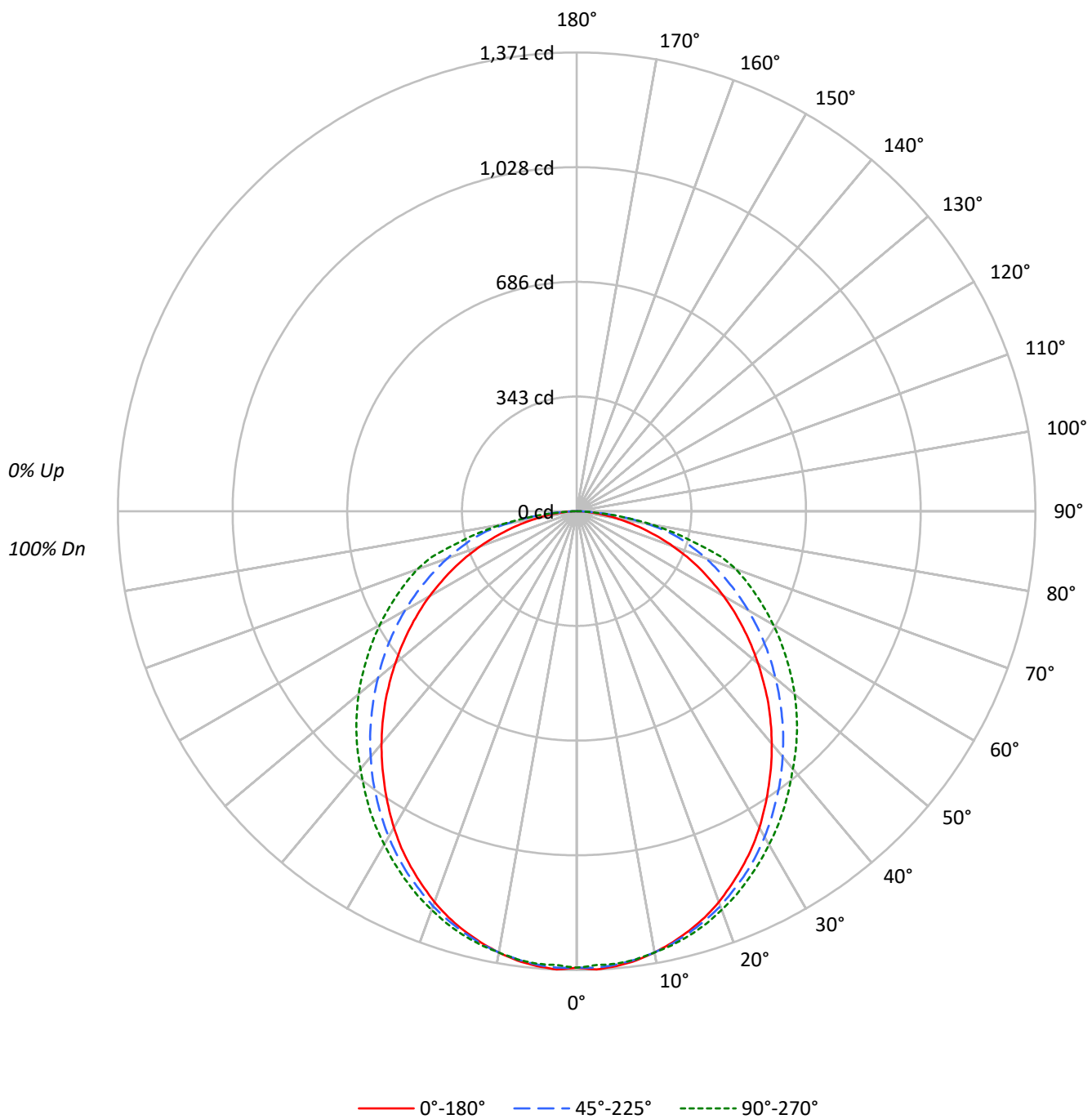
Lumens per Lamp: N/A  
Luminaire Lumens: 3882.0 lumens  
Efficiency: N/A  
Efficacy: 126.4 lumens/watt  
Spacing Criteria (0/90/45): 1.19 / 1.26 / 1.35  
Luminous Opening: Rectangular (W 2' x L: 4' x H: 0')  
CIE Type: Direct

Input Watts (W): 30.7  
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: P982888

CATALOG NUMBER: 24CZ-LD5-40-UNV-L840-CD1-U

### Luminous Intensity Polar Plot



TEST NUMBER: P982888

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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  | 106 | 101 | 97  | 93  |  | 97  | 93  | 90  |  | 93  | 90  | 88  |  | 89  | 87  | 85  |
| 2   | 98  | 90  | 83  | 77  | 96  | 88  | 81  | 76  |  | 84  | 79  | 74  |  | 81  | 76  | 72  |  | 78  | 74  | 71  |
| 3   | 89  | 79  | 70  | 63  | 87  | 77  | 69  | 63  |  | 74  | 67  | 62  |  | 71  | 65  | 61  |  | 69  | 64  | 60  |
| 4   | 82  | 69  | 60  | 54  | 79  | 68  | 60  | 53  |  | 66  | 58  | 52  |  | 63  | 57  | 52  |  | 61  | 56  | 51  |
| 5   | 75  | 62  | 53  | 46  | 73  | 61  | 52  | 46  |  | 59  | 51  | 45  |  | 57  | 50  | 45  |  | 55  | 49  | 44  |
| 6   | 69  | 56  | 47  | 40  | 67  | 55  | 46  | 40  |  | 53  | 45  | 40  |  | 51  | 44  | 39  |  | 50  | 44  | 39  |
| 7   | 64  | 51  | 42  | 35  | 63  | 50  | 41  | 35  |  | 48  | 41  | 35  |  | 47  | 40  | 35  |  | 45  | 39  | 35  |
| 8   | 60  | 46  | 38  | 32  | 58  | 45  | 37  | 32  |  | 44  | 37  | 31  |  | 43  | 36  | 31  |  | 42  | 36  | 31  |
| 9   | 56  | 42  | 34  | 28  | 55  | 42  | 34  | 28  |  | 41  | 33  | 28  |  | 40  | 33  | 28  |  | 39  | 32  | 28  |
| 10  | 52  | 39  | 31  | 26  | 51  | 39  | 31  | 26  |  | 38  | 31  | 26  |  | 37  | 30  | 26  |  | 36  | 30  | 25  |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 1836 | 1836 | 1836 |
| 5°  | 1843 | 1837 | 1834 |
| 10° | 1830 | 1830 | 1830 |
| 15° | 1808 | 1816 | 1827 |
| 20° | 1779 | 1798 | 1815 |
| 25° | 1741 | 1774 | 1802 |
| 30° | 1697 | 1746 | 1787 |
| 35° | 1644 | 1714 | 1777 |
| 40° | 1594 | 1682 | 1765 |
| 45° | 1540 | 1651 | 1772 |
| 50° | 1482 | 1623 | 1780 |
| 55° | 1425 | 1605 | 1794 |
| 60° | 1365 | 1592 | 1827 |
| 65° | 1295 | 1589 | 1883 |
| 70° | 1205 | 1616 | 1990 |
| 75° | 1078 | 1682 | 1908 |
| 80° | 921  | 1606 | 1750 |
| 85° | 713  | 1284 | 1223 |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 90°

Vertical Angle: 72.5°

Luminance: 2027 cd/sqm

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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 129.0  | 3.3       |
| 10°-20°   | 367.2  | 9.5       |
| 20°-30°   | 548.9  | 14.1      |
| 30°-40°   | 650.8  | 16.8      |
| 40°-50°   | 669.3  | 17.2      |
| 50°-60°   | 612.2  | 15.8      |
| 60°-70°   | 493.8  | 12.7      |
| 70°-80°   | 320.6  | 8.3       |
| 80°-90°   | 90.2   | 2.3       |
| 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°    | 1045.0 | 26.9      |
| 0°-40°    | 1695.9 | 43.7      |
| 0°-60°    | 2977.4 | 76.7      |
| 0°-90°    | 3882.0 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 3882.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|-----|------|-------|------|-------|------|------|
| 0°  | 1364 | 1364  | 1364 | 1364  | 1364 |      |
| 5°  | 1364 | 1355  | 1360 | 1358  | 1358 | 129  |
| 15° | 1298 | 1292  | 1303 | 1309  | 1311 | 366  |
| 25° | 1173 | 1173  | 1195 | 1204  | 1214 | 540  |
| 35° | 1001 | 1010  | 1043 | 1064  | 1082 | 626  |
| 45° | 810  | 824   | 868  | 907   | 931  | 624  |
| 55° | 608  | 627   | 684  | 738   | 765  | 543  |
| 65° | 407  | 430   | 499  | 564   | 592  | 402  |
| 75° | 207  | 246   | 324  | 363   | 367  | 221  |
| 85° | 46   | 77    | 83   | 82    | 79   | 56   |
| 90° | 0    | 0     | 0    | 0     | 0    |      |

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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|-------|--------|--------|--------|--------|--------|
| 0°    | 1364.2 | 1364.2 | 1364.2 | 1364.2 | 1364.2 |
| 2.5°  | 1370.8 | 1360.2 | 1365.5 | 1362.9 | 1357.6 |
| 5°    | 1364.2 | 1354.9 | 1360.2 | 1357.6 | 1357.6 |
| 7.5°  | 1354.9 | 1345.7 | 1351.0 | 1351.0 | 1351.0 |
| 10°   | 1339.1 | 1331.2 | 1339.1 | 1339.1 | 1339.1 |
| 12.5° | 1320.6 | 1314.0 | 1323.2 | 1324.6 | 1327.2 |
| 15°   | 1298.1 | 1291.6 | 1303.4 | 1308.7 | 1311.4 |
| 17.5° | 1273.1 | 1267.8 | 1281.0 | 1287.6 | 1291.6 |
| 20°   | 1242.7 | 1238.7 | 1255.9 | 1262.5 | 1267.8 |
| 22.5° | 1208.3 | 1208.3 | 1225.5 | 1233.4 | 1242.7 |
| 25°   | 1172.7 | 1172.7 | 1195.1 | 1204.4 | 1213.6 |
| 27.5° | 1134.4 | 1135.7 | 1160.8 | 1174.0 | 1183.3 |
| 30°   | 1092.2 | 1097.4 | 1123.8 | 1139.7 | 1150.2 |
| 32.5° | 1047.2 | 1053.9 | 1084.2 | 1104.0 | 1117.2 |
| 35°   | 1001.0 | 1010.3 | 1043.3 | 1064.4 | 1081.6 |
| 37.5° | 954.8  | 966.7  | 1002.3 | 1026.1 | 1043.3 |
| 40°   | 907.3  | 920.5  | 957.4  | 985.1  | 1005.0 |
| 42.5° | 858.4  | 872.9  | 913.8  | 945.5  | 969.3  |
| 45°   | 809.5  | 824.0  | 867.6  | 907.3  | 931.0  |
| 47.5° | 758.0  | 775.2  | 821.4  | 867.6  | 891.4  |
| 50°   | 707.8  | 726.3  | 775.2  | 825.4  | 850.5  |
| 52.5° | 657.7  | 678.8  | 730.3  | 783.1  | 808.2  |
| 55°   | 607.5  | 627.3  | 684.1  | 738.2  | 764.6  |
| 57.5° | 557.3  | 578.4  | 637.8  | 694.6  | 722.3  |
| 60°   | 507.1  | 529.6  | 591.6  | 651.0  | 678.8  |
| 62.5° | 455.6  | 479.4  | 545.4  | 607.5  | 635.2  |
| 65°   | 406.8  | 430.5  | 499.2  | 563.9  | 591.6  |
| 67.5° | 356.5  | 383.0  | 454.3  | 520.3  | 549.4  |
| 70°   | 306.4  | 335.4  | 410.7  | 476.7  | 505.8  |
| 72.5° | 256.2  | 289.2  | 365.8  | 431.8  | 453.0  |
| 75°   | 207.3  | 245.6  | 323.5  | 363.2  | 367.1  |
| 77.5° | 162.4  | 202.1  | 276.0  | 291.9  | 299.8  |
| 80°   | 118.8  | 162.4  | 207.3  | 227.1  | 225.8  |
| 82.5° | 79.2   | 124.1  | 149.2  | 151.9  | 149.2  |
| 85°   | 46.2   | 76.6   | 83.2   | 81.9   | 79.2   |
| 87.5° | 19.8   | 30.4   | 26.4   | 22.4   | 18.5   |
| 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

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| 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           |
|                                |                       |                  |                      |

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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 4000K 4-step quadrangle

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### Photopic Flux vs. Wavelength



### Photopic Lumens: NR

| λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</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            |        |                          |               |

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### 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**

| $\lambda$<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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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)