

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: P982945

Luminaire Tested: 24CZ-LD5-45SE-UNV-L935-S-CD1-U

Issue Date: 04/23/2025

**Test Information**

Test Method: LM-79-2019  
Report Number: P982945  
Test Lab: INNOVATION CENTER(P3)  
Issue Date: 04/23/2025  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: METALUX  
Catalog Number: 24CZ-LD5-45SE-UNV-L935-S-CD1-U  
Description: METALUX CRUZE 2x4 4500LM STANDARD EFFICACY PACKAGE 90CRI 3500K TROFFER SMOOTH  
Light Source: 3500K CCT, 90 CRI LEDS  
Ballast/Driver: -

**Summary**

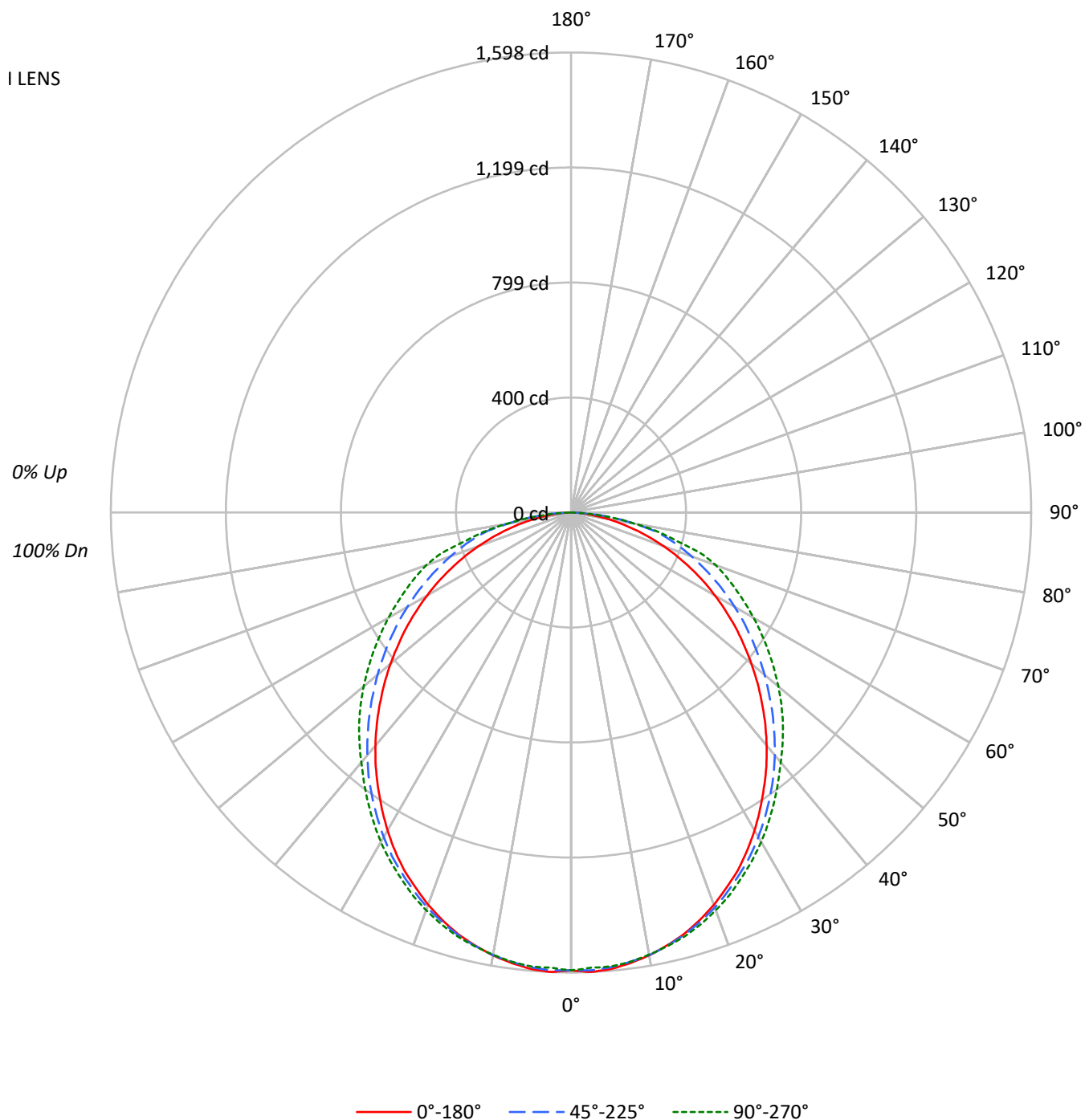
Lumens per Lamp: N/A  
Luminaire Lumens: 4392.9 lumens  
Efficiency: N/A  
Efficacy: 125.5 lumens/watt  
Spacing Criteria (0/90/45): 1.19 / 1.23 / 1.33  
Luminous Opening: Rectangular (W 2' x L: 4' x H: 0')  
CIE Type: Direct

Input Watts (W): 35  
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

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CATALOG NUMBER: 24CZ-LD5-45SE-UNV-L935-S-CD1-U

### Luminous Intensity Polar Plot



TEST NUMBER: P982945

CATALOG NUMBER: 24CZ-LD5-45SE-UNV-L935-S-CD1-U

**COEFFICIENT OF UTILIZATION - ZONAL CAVITY METHOD:**

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|
| RF  | 20  |     |     |     | 20  |     |     |     |     | 20  |     |     |     |     | 20  |     |     |     |    | 20 |
| RC  | 80  |     |     |     | 70  |     |     |     |     | 50  |     |     |     |     | 30  |     |     |     |    | 10 |
| RW  | 70  | 50  | 30  | 10  | 70  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30 | 10 |
| RCR |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |
| 0   | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 | 106 | 106 | 106 | 102 | 102 | 102 | 100 |    |    |
| 1   | 108 | 104 | 99  | 95  | 106 | 101 | 97  | 94  | 97  | 94  | 91  | 93  | 90  | 88  | 89  | 87  | 85  | 83  |    |    |
| 2   | 99  | 90  | 83  | 77  | 96  | 88  | 82  | 76  | 85  | 79  | 75  | 81  | 77  | 73  | 78  | 75  | 71  | 69  |    |    |
| 3   | 90  | 79  | 71  | 64  | 87  | 77  | 70  | 64  | 74  | 68  | 62  | 72  | 66  | 61  | 69  | 64  | 60  | 58  |    |    |
| 4   | 82  | 70  | 61  | 54  | 80  | 69  | 60  | 54  | 66  | 59  | 53  | 64  | 58  | 52  | 62  | 56  | 52  | 50  |    |    |
| 5   | 76  | 63  | 53  | 47  | 73  | 61  | 53  | 47  | 59  | 52  | 46  | 57  | 51  | 45  | 55  | 50  | 45  | 43  |    |    |
| 6   | 70  | 56  | 47  | 41  | 68  | 55  | 47  | 41  | 54  | 46  | 40  | 52  | 45  | 40  | 50  | 44  | 40  | 38  |    |    |
| 7   | 65  | 51  | 42  | 36  | 63  | 50  | 42  | 36  | 49  | 41  | 36  | 47  | 41  | 35  | 46  | 40  | 35  | 33  |    |    |
| 8   | 60  | 47  | 38  | 32  | 59  | 46  | 38  | 32  | 45  | 37  | 32  | 43  | 37  | 32  | 42  | 36  | 32  | 30  |    |    |
| 9   | 56  | 43  | 35  | 29  | 55  | 42  | 34  | 29  | 41  | 34  | 29  | 40  | 33  | 29  | 39  | 33  | 29  | 27  |    |    |
| 10  | 53  | 40  | 32  | 26  | 52  | 39  | 31  | 26  | 38  | 31  | 26  | 37  | 31  | 26  | 36  | 30  | 26  | 24  |    |    |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 2140 | 2140 | 2140 |
| 5°  | 2150 | 2142 | 2138 |
| 10° | 2135 | 2133 | 2131 |
| 15° | 2111 | 2115 | 2124 |
| 20° | 2076 | 2091 | 2105 |
| 25° | 2036 | 2057 | 2079 |
| 30° | 1980 | 2021 | 2053 |
| 35° | 1918 | 1978 | 2019 |
| 40° | 1856 | 1933 | 1990 |
| 45° | 1786 | 1883 | 1980 |
| 50° | 1713 | 1836 | 1967 |
| 55° | 1639 | 1797 | 1961 |
| 60° | 1554 | 1766 | 1971 |
| 65° | 1461 | 1745 | 2010 |
| 70° | 1345 | 1754 | 2105 |
| 75° | 1193 | 1816 | 1960 |
| 80° | 996  | 1722 | 1767 |
| 85° | 744  | 1377 | 1264 |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 90°

Vertical Angle: 72.5°

Luminance: 2119 cd/sqm

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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 150.4  | 3.4       |
| 10°-20°   | 427.6  | 9.7       |
| 20°-30°   | 637.3  | 14.5      |
| 30°-40°   | 750.1  | 17.1      |
| 40°-50°   | 762.3  | 17.4      |
| 50°-60°   | 685.4  | 15.6      |
| 60°-70°   | 541.5  | 12.3      |
| 70°-80°   | 343.5  | 7.8       |
| 80°-90°   | 94.8   | 2.2       |
| 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°    | 1215.2 | 27.7      |
| 0°-40°    | 1965.4 | 44.7      |
| 0°-60°    | 3413.1 | 77.7      |
| 0°-90°    | 4392.9 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 4392.9 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|-----|------|-------|------|-------|------|------|
| 0°  | 1590 | 1590  | 1590 | 1590  | 1590 |      |
| 5°  | 1592 | 1579  | 1586 | 1583  | 1583 | 151  |
| 15° | 1516 | 1508  | 1519 | 1523  | 1524 | 427  |
| 25° | 1371 | 1370  | 1386 | 1394  | 1400 | 630  |
| 35° | 1168 | 1175  | 1204 | 1218  | 1229 | 731  |
| 45° | 938  | 952   | 990  | 1019  | 1041 | 724  |
| 55° | 699  | 716   | 766  | 816   | 836  | 624  |
| 65° | 459  | 482   | 548  | 608   | 631  | 455  |
| 75° | 230  | 269   | 349  | 380   | 377  | 244  |
| 85° | 48   | 83    | 89   | 82    | 82   | 59   |
| 90° | 0    | 0     | 0    | 0     | 0    |      |

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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|-------|--------|--------|--------|--------|--------|
| 0°    | 1590.3 | 1590.3 | 1590.3 | 1590.3 | 1590.3 |
| 2.5°  | 1597.6 | 1585.9 | 1591.8 | 1588.9 | 1583.0 |
| 5°    | 1591.8 | 1578.6 | 1585.9 | 1583.0 | 1583.0 |
| 7.5°  | 1578.6 | 1568.4 | 1574.3 | 1572.8 | 1574.3 |
| 10°   | 1562.5 | 1552.3 | 1561.1 | 1561.1 | 1559.6 |
| 12.5° | 1540.6 | 1531.8 | 1542.1 | 1542.1 | 1543.6 |
| 15°   | 1515.8 | 1508.4 | 1518.7 | 1523.1 | 1524.5 |
| 17.5° | 1485.1 | 1477.8 | 1490.9 | 1495.3 | 1499.7 |
| 20°   | 1450.0 | 1447.1 | 1460.2 | 1464.6 | 1470.4 |
| 22.5° | 1410.5 | 1410.5 | 1423.7 | 1429.6 | 1438.3 |
| 25°   | 1371.1 | 1369.6 | 1385.7 | 1394.4 | 1400.3 |
| 27.5° | 1324.3 | 1325.7 | 1346.2 | 1355.0 | 1362.3 |
| 30°   | 1274.6 | 1277.5 | 1300.9 | 1311.1 | 1321.3 |
| 32.5° | 1221.9 | 1227.8 | 1254.1 | 1265.8 | 1276.0 |
| 35°   | 1167.9 | 1175.2 | 1204.4 | 1217.6 | 1229.2 |
| 37.5° | 1113.8 | 1124.0 | 1154.7 | 1167.9 | 1181.0 |
| 40°   | 1056.8 | 1065.6 | 1100.6 | 1116.7 | 1132.8 |
| 42.5° | 998.4  | 1010.0 | 1045.1 | 1068.5 | 1087.5 |
| 45°   | 938.4  | 951.6  | 989.6  | 1018.8 | 1040.7 |
| 47.5° | 878.5  | 896.0  | 932.5  | 972.0  | 991.0  |
| 50°   | 818.5  | 836.1  | 877.0  | 920.9  | 939.9  |
| 52.5° | 757.2  | 774.7  | 821.5  | 866.8  | 887.2  |
| 55°   | 698.7  | 716.2  | 765.9  | 815.6  | 836.1  |
| 57.5° | 637.3  | 656.3  | 711.8  | 763.0  | 783.4  |
| 60°   | 577.3  | 596.4  | 656.3  | 710.4  | 732.3  |
| 62.5° | 518.9  | 539.3  | 602.2  | 659.2  | 681.2  |
| 65°   | 459.0  | 482.4  | 548.1  | 608.0  | 631.4  |
| 67.5° | 400.5  | 426.8  | 495.5  | 558.4  | 583.2  |
| 70°   | 342.0  | 372.7  | 445.8  | 510.1  | 535.0  |
| 72.5° | 285.0  | 318.6  | 396.1  | 460.5  | 473.6  |
| 75°   | 229.5  | 268.9  | 349.3  | 380.0  | 377.1  |
| 77.5° | 176.8  | 220.7  | 296.7  | 302.6  | 311.3  |
| 80°   | 128.6  | 176.8  | 222.2  | 233.9  | 228.0  |
| 82.5° | 84.8   | 133.0  | 159.3  | 153.5  | 152.0  |
| 85°   | 48.2   | 83.3   | 89.2   | 81.9   | 81.9   |
| 87.5° | 20.5   | 33.6   | 29.2   | 21.9   | 20.5   |
| 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: SP3-2508-516-6

Test Date: 09/03/2025

Luminaire Tested: 24CZ-LD5-65-S-UNV-L935-CD1-U

Data in this report applies to families of products including 24CZ-LD5-65-S-UNV-L935-CD1-U

### Test Information

Test Method: LM-79-2019  
 Report Number: SP3-2508-516-6  
 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-L935-CD1-U**  
 Description: 2X4 CRUZE SB 6500LM 935 SMOOTH LENS

### Spectral Parameters

CCT (K): 3412  
 CIE  $u'$ : 0.2386  
 CIE  $v'$ : 0.5111  
 Duv: -0.0015  
 CIE x: 0.4087  
 CIE y: 0.3890  
 CIE z: 0.2023  
 Peak Wavelength (nm): 630  
 Dominant Wavelength (nm): 581  
 Purity: 39.41044  
 R<sub>f</sub>: 92.6  
 R<sub>g</sub>: 102

CRI (Ra): 96.3  
 R1: 99.2  
 R2: 97.9  
 R3: 94.7  
 R4: 96.6  
 R5: 98.4  
 R6: 96.1  
 R7: 95.6  
 R8: 92.0  
 R9: 78.4  
 R10: 93.0  
 R11: 94.5  
 R12: 81.5  
 R13: 99.0  
 R14: 95.8  
 R15: 96.7



### Test Conditions

Stabilization Time: 20M  
 Operation Time: 1H 20M  
 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 3500K 4-step quadrangle

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### Photopic Flux vs. Wavelength



### Photopic Lumens: NR

| $\lambda$<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               | 112                                    | NR                             | 620               | 281                                    | NR                             | 750               | 6                                      | NR                             | 880               | 0                                      | NR                             |
| 365               | 0                                      | NR                             | 495               | 134                                    | NR                             | 625               | 286                                    | NR                             | 755               | 5                                      | NR                             | 885               | 0                                      | NR                             |
| 370               | 0                                      | NR                             | 500               | 157                                    | NR                             | 630               | 1000                                   | NR                             | 760               | 4                                      | NR                             | 890               | 0                                      | NR                             |
| 375               | 0                                      | NR                             | 505               | 178                                    | NR                             | 635               | 695                                    | NR                             | 765               | 4                                      | NR                             | 895               | 0                                      | NR                             |
| 380               | 0                                      | NR                             | 510               | 193                                    | NR                             | 640               | 181                                    | NR                             | 770               | 3                                      | NR                             | 900               | 0                                      | NR                             |
| 385               | 0                                      | NR                             | 515               | 206                                    | NR                             | 645               | 175                                    | NR                             | 775               | 3                                      | NR                             | 905               | 0                                      | NR                             |
| 390               | 0                                      | NR                             | 520               | 213                                    | NR                             | 650               | 156                                    | NR                             | 780               | 2                                      | NR                             | 910               | 0                                      | NR                             |
| 395               | 1                                      | NR                             | 525               | 219                                    | NR                             | 655               | 127                                    | NR                             | 785               | 2                                      | NR                             | 915               | 0                                      | NR                             |
| 400               | 2                                      | NR                             | 530               | 223                                    | NR                             | 660               | 108                                    | NR                             | 790               | 2                                      | NR                             | 920               | 0                                      | NR                             |
| 405               | 2                                      | NR                             | 535               | 226                                    | NR                             | 665               | 89                                     | NR                             | 795               | 2                                      | NR                             | 925               | 0                                      | NR                             |
| 410               | 4                                      | NR                             | 540               | 230                                    | NR                             | 670               | 84                                     | NR                             | 800               | 1                                      | NR                             | 930               | 0                                      | NR                             |
| 415               | 6                                      | NR                             | 545               | 235                                    | NR                             | 675               | 67                                     | NR                             | 805               | 1                                      | NR                             | 935               | 0                                      | NR                             |
| 420               | 11                                     | NR                             | 550               | 239                                    | NR                             | 680               | 57                                     | NR                             | 810               | 1                                      | NR                             | 940               | 0                                      | NR                             |
| 425               | 19                                     | NR                             | 555               | 243                                    | NR                             | 685               | 50                                     | NR                             | 815               | 1                                      | NR                             | 945               | 0                                      | NR                             |
| 430               | 34                                     | NR                             | 560               | 248                                    | NR                             | 690               | 42                                     | NR                             | 820               | 1                                      | NR                             | 950               | 0                                      | NR                             |
| 435               | 60                                     | NR                             | 565               | 253                                    | NR                             | 695               | 36                                     | NR                             | 825               | 1                                      | NR                             | 955               | 0                                      | NR                             |
| 440               | 106                                    | NR                             | 570               | 256                                    | NR                             | 700               | 31                                     | NR                             | 830               | 0                                      | NR                             | 960               | 0                                      | NR                             |
| 445               | 193                                    | NR                             | 575               | 260                                    | NR                             | 705               | 26                                     | NR                             | 835               | 0                                      | NR                             | 965               | 0                                      | NR                             |
| 450               | 283                                    | NR                             | 580               | 263                                    | NR                             | 710               | 22                                     | NR                             | 840               | 0                                      | NR                             | 970               | 0                                      | NR                             |
| 455               | 234                                    | NR                             | 585               | 266                                    | NR                             | 715               | 19                                     | NR                             | 845               | 0                                      | NR                             | 975               | 0                                      | NR                             |
| 460               | 157                                    | NR                             | 590               | 267                                    | NR                             | 720               | 16                                     | NR                             | 850               | 0                                      | NR                             | 980               | 0                                      | NR                             |
| 465               | 134                                    | NR                             | 595               | 266                                    | NR                             | 725               | 14                                     | NR                             | 855               | 0                                      | NR                             | 985               | 0                                      | NR                             |
| 470               | 107                                    | NR                             | 600               | 268                                    | NR                             | 730               | 12                                     | NR                             | 860               | 0                                      | NR                             | 990               | 0                                      | NR                             |
| 475               | 85                                     | NR                             | 605               | 269                                    | NR                             | 735               | 10                                     | NR                             | 865               | 0                                      | NR                             | 995               | 0                                      | NR                             |
| 480               | 85                                     | NR                             | 610               | 309                                    | NR                             | 740               | 8                                      | NR                             | 870               | 0                                      | NR                             | 1000              | 0                                      | NR                             |
| 485               | 96                                     | NR                             | 615               | 345                                    | NR                             | 745               | 7                                      | NR                             | 875               | 0                                      | NR                             |                   |                                        |                                |

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### Scotopic Flux vs. Wavelength



Scotopic Lumens: NR

S/P: 1.61

| 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    | 112                      | NR            | 620    | 281                      | NR            | 750    | 6                        | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 134                      | NR            | 625    | 286                      | NR            | 755    | 5                        | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 157                      | NR            | 630    | 1000                     | NR            | 760    | 4                        | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 178                      | NR            | 635    | 695                      | NR            | 765    | 4                        | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 193                      | NR            | 640    | 181                      | NR            | 770    | 3                        | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 206                      | NR            | 645    | 175                      | NR            | 775    | 3                        | NR            | 905    | 0                        | NR            |
| 390    | 0                        | NR            | 520    | 213                      | NR            | 650    | 156                      | NR            | 780    | 2                        | NR            | 910    | 0                        | NR            |
| 395    | 1                        | NR            | 525    | 219                      | NR            | 655    | 127                      | NR            | 785    | 2                        | NR            | 915    | 0                        | NR            |
| 400    | 2                        | NR            | 530    | 223                      | NR            | 660    | 108                      | NR            | 790    | 2                        | NR            | 920    | 0                        | NR            |
| 405    | 2                        | NR            | 535    | 226                      | NR            | 665    | 89                       | NR            | 795    | 2                        | NR            | 925    | 0                        | NR            |
| 410    | 4                        | NR            | 540    | 230                      | NR            | 670    | 84                       | NR            | 800    | 1                        | NR            | 930    | 0                        | NR            |
| 415    | 6                        | NR            | 545    | 235                      | NR            | 675    | 67                       | NR            | 805    | 1                        | NR            | 935    | 0                        | NR            |
| 420    | 11                       | NR            | 550    | 239                      | NR            | 680    | 57                       | NR            | 810    | 1                        | NR            | 940    | 0                        | NR            |
| 425    | 19                       | NR            | 555    | 243                      | NR            | 685    | 50                       | NR            | 815    | 1                        | NR            | 945    | 0                        | NR            |
| 430    | 34                       | NR            | 560    | 248                      | NR            | 690    | 42                       | NR            | 820    | 1                        | NR            | 950    | 0                        | NR            |
| 435    | 60                       | NR            | 565    | 253                      | NR            | 695    | 36                       | NR            | 825    | 1                        | NR            | 955    | 0                        | NR            |
| 440    | 106                      | NR            | 570    | 256                      | NR            | 700    | 31                       | NR            | 830    | 0                        | NR            | 960    | 0                        | NR            |
| 445    | 193                      | NR            | 575    | 260                      | NR            | 705    | 26                       | NR            | 835    | 0                        | NR            | 965    | 0                        | NR            |
| 450    | 283                      | NR            | 580    | 263                      | NR            | 710    | 22                       | NR            | 840    | 0                        | NR            | 970    | 0                        | NR            |
| 455    | 234                      | NR            | 585    | 266                      | NR            | 715    | 19                       | NR            | 845    | 0                        | NR            | 975    | 0                        | NR            |
| 460    | 157                      | NR            | 590    | 267                      | NR            | 720    | 16                       | NR            | 850    | 0                        | NR            | 980    | 0                        | NR            |
| 465    | 134                      | NR            | 595    | 266                      | NR            | 725    | 14                       | NR            | 855    | 0                        | NR            | 985    | 0                        | NR            |
| 470    | 107                      | NR            | 600    | 268                      | NR            | 730    | 12                       | NR            | 860    | 0                        | NR            | 990    | 0                        | NR            |
| 475    | 85                       | NR            | 605    | 269                      | NR            | 735    | 10                       | NR            | 865    | 0                        | NR            | 995    | 0                        | NR            |
| 480    | 85                       | NR            | 610    | 309                      | NR            | 740    | 8                        | NR            | 870    | 0                        | NR            | 1000   | 0                        | NR            |
| 485    | 96                       | NR            | 615    | 345                      | NR            | 745    | 7                        | NR            | 875    | 0                        | NR            |        |                          |               |

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### Melanopic Flux vs. Wavelength



Melanopic Lumens: NR

M/P: 3.24

| 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    | 112                      | NR            | 620    | 281                      | NR            | 750    | 6                        | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 134                      | NR            | 625    | 286                      | NR            | 755    | 5                        | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 157                      | NR            | 630    | 1000                     | NR            | 760    | 4                        | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 178                      | NR            | 635    | 695                      | NR            | 765    | 4                        | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 193                      | NR            | 640    | 181                      | NR            | 770    | 3                        | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 206                      | NR            | 645    | 175                      | NR            | 775    | 3                        | NR            | 905    | 0                        | NR            |
| 390    | 0                        | NR            | 520    | 213                      | NR            | 650    | 156                      | NR            | 780    | 2                        | NR            | 910    | 0                        | NR            |
| 395    | 1                        | NR            | 525    | 219                      | NR            | 655    | 127                      | NR            | 785    | 2                        | NR            | 915    | 0                        | NR            |
| 400    | 2                        | NR            | 530    | 223                      | NR            | 660    | 108                      | NR            | 790    | 2                        | NR            | 920    | 0                        | NR            |
| 405    | 2                        | NR            | 535    | 226                      | NR            | 665    | 89                       | NR            | 795    | 2                        | NR            | 925    | 0                        | NR            |
| 410    | 4                        | NR            | 540    | 230                      | NR            | 670    | 84                       | NR            | 800    | 1                        | NR            | 930    | 0                        | NR            |
| 415    | 6                        | NR            | 545    | 235                      | NR            | 675    | 67                       | NR            | 805    | 1                        | NR            | 935    | 0                        | NR            |
| 420    | 11                       | NR            | 550    | 239                      | NR            | 680    | 57                       | NR            | 810    | 1                        | NR            | 940    | 0                        | NR            |
| 425    | 19                       | NR            | 555    | 243                      | NR            | 685    | 50                       | NR            | 815    | 1                        | NR            | 945    | 0                        | NR            |
| 430    | 34                       | NR            | 560    | 248                      | NR            | 690    | 42                       | NR            | 820    | 1                        | NR            | 950    | 0                        | NR            |
| 435    | 60                       | NR            | 565    | 253                      | NR            | 695    | 36                       | NR            | 825    | 1                        | NR            | 955    | 0                        | NR            |
| 440    | 106                      | NR            | 570    | 256                      | NR            | 700    | 31                       | NR            | 830    | 0                        | NR            | 960    | 0                        | NR            |
| 445    | 193                      | NR            | 575    | 260                      | NR            | 705    | 26                       | NR            | 835    | 0                        | NR            | 965    | 0                        | NR            |
| 450    | 283                      | NR            | 580    | 263                      | NR            | 710    | 22                       | NR            | 840    | 0                        | NR            | 970    | 0                        | NR            |
| 455    | 234                      | NR            | 585    | 266                      | NR            | 715    | 19                       | NR            | 845    | 0                        | NR            | 975    | 0                        | NR            |
| 460    | 157                      | NR            | 590    | 267                      | NR            | 720    | 16                       | NR            | 850    | 0                        | NR            | 980    | 0                        | NR            |
| 465    | 134                      | NR            | 595    | 266                      | NR            | 725    | 14                       | NR            | 855    | 0                        | NR            | 985    | 0                        | NR            |
| 470    | 107                      | NR            | 600    | 268                      | NR            | 730    | 12                       | NR            | 860    | 0                        | NR            | 990    | 0                        | NR            |
| 475    | 85                       | NR            | 605    | 269                      | NR            | 735    | 10                       | NR            | 865    | 0                        | NR            | 995    | 0                        | NR            |
| 480    | 85                       | NR            | 610    | 309                      | NR            | 740    | 8                        | NR            | 870    | 0                        | NR            | 1000   | 0                        | NR            |
| 485    | 96                       | NR            | 615    | 345                      | NR            | 745    | 7                        | NR            | 875    | 0                        | NR            |        |                          |               |

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TM-30-18

### Summary

$R_f = 92.6$   
 $R_g = 102$   
 $\text{CIE } R_a = 96.3$   
 $R_9 = 78.4$



### Color Vector Graphics



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

|            |            |             |            |
|------------|------------|-------------|------------|
| CES01 = 86 | CES26 = 94 | CES51 = 97  | CES76 = 88 |
| CES02 = 63 | CES27 = 93 | CES52 = 96  | CES77 = 88 |
| CES03 = 32 | CES28 = 96 | CES53 = 95  | CES78 = 84 |
| CES04 = 70 | CES29 = 95 | CES54 = 95  | CES79 = 92 |
| CES05 = 50 | CES30 = 96 | CES55 = 95  | CES80 = 92 |
| CES06 = 51 | CES31 = 95 | CES56 = 98  | CES81 = 77 |
| CES07 = 43 | CES32 = 87 | CES57 = 98  | CES82 = 96 |
| CES08 = 42 | CES33 = 97 | CES58 = 98  | CES83 = 95 |
| CES09 = 29 | CES34 = 93 | CES59 = 100 | CES84 = 95 |
| CES10 = 75 | CES35 = 96 | CES60 = 94  | CES85 = 82 |
| CES11 = 58 | CES36 = 84 | CES61 = 95  | CES86 = 84 |
| CES12 = 64 | CES37 = 93 | CES62 = 90  | CES87 = 92 |
| CES13 = 44 | CES38 = 91 | CES63 = 95  | CES88 = 99 |
| CES14 = 74 | CES39 = 98 | CES64 = 95  | CES89 = 86 |
| CES15 = 72 | CES40 = 96 | CES65 = 92  | CES90 = 98 |
| CES16 = 48 | CES41 = 97 | CES66 = 93  | CES91 = 77 |
| CES17 = 49 | CES42 = 90 | CES67 = 92  | CES92 = 81 |
| CES18 = 56 | CES43 = 91 | CES68 = 91  | CES93 = 88 |
| CES19 = 71 | CES44 = 99 | CES69 = 92  | CES94 = 78 |
| CES20 = 67 | CES45 = 94 | CES70 = 89  | CES95 = 86 |
| CES21 = 86 | CES46 = 95 | CES71 = 85  | CES96 = 93 |
| CES22 = 78 | CES47 = 90 | CES72 = 95  | CES97 = 93 |
| CES23 = 91 | CES48 = 96 | CES73 = 84  | CES98 = 96 |
| CES24 = 90 | CES49 = 93 | CES74 = 91  | CES99 = 97 |
| CES25 = 71 | CES50 = 97 | CES75 = 86  |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)