

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: P983151

Luminaire Tested: 24CZ-LD5-65SE-UNV-L930-SQP-CD1-U

Issue Date: 04/23/2025

**Test Information**

Test Method: LM-79-2019  
Report Number: P983151  
Test Lab: INNOVATION CENTER(P3)  
Issue Date: 04/23/2025  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: METALUX  
Catalog Number: 24CZ-LD5-65SE-UNV-L930-SQP-CD1-U  
Description: METALUX CRUZE 2x4 6500LM STANDARD EFFICACY PACKAGE 90CRI 3000K TROFFER LENS WITH PATTERN INSERT  
Light Source: 3000K CCT, 90 CRI LEDS  
Ballast/Driver: -

**Summary**

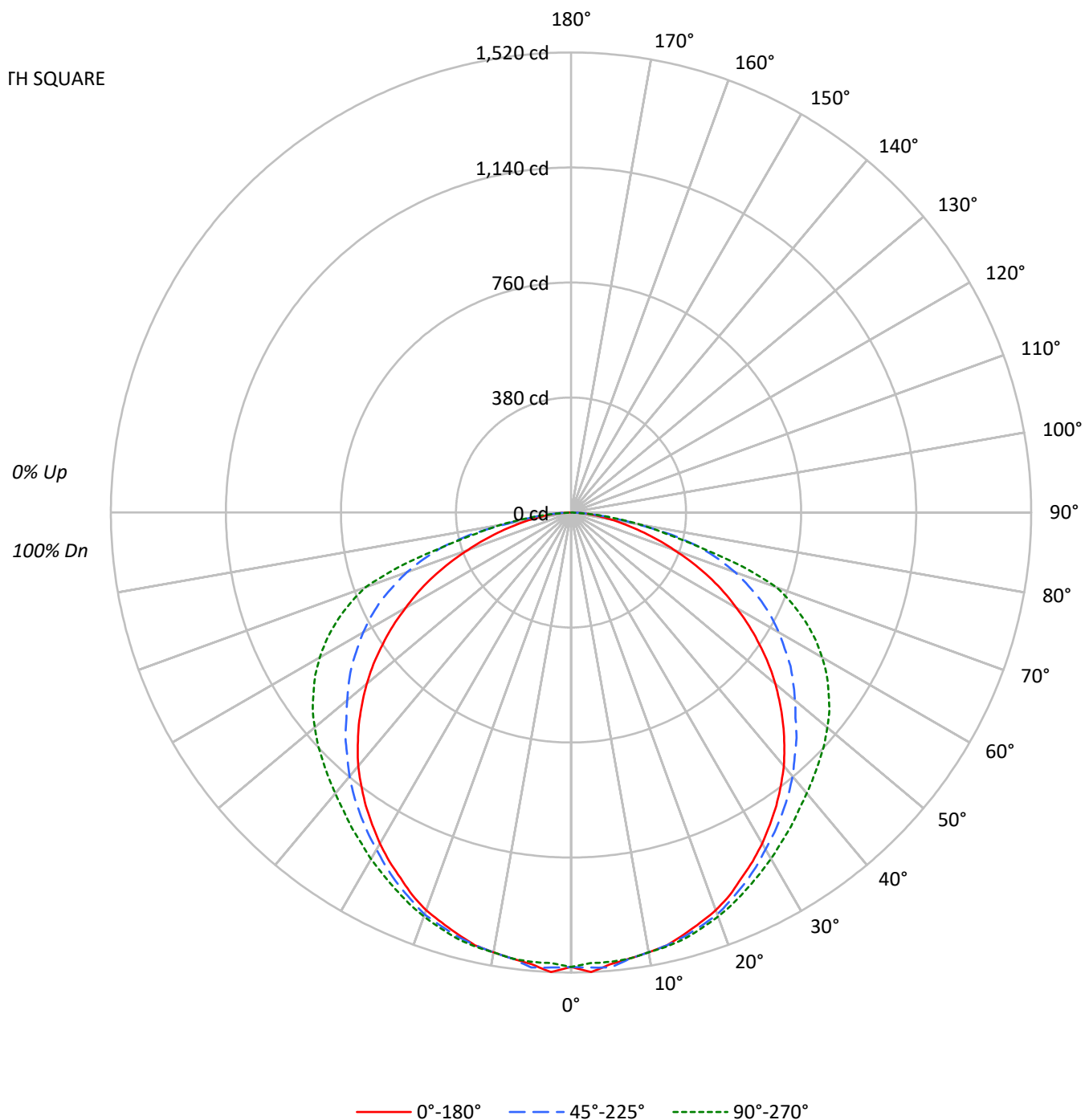
Lumens per Lamp: N/A  
Luminaire Lumens: 4726.9 lumens  
Efficiency: N/A  
Efficacy: 94.3 lumens/watt  
Spacing Criteria (0/90/45): 1.25 / 1.31 / 1.41  
Luminous Opening: Rectangular (W 2' x L: 4' x H: 0')  
CIE Type: Direct

Input Watts (W): 50.1  
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: P983151

CATALOG NUMBER: 24CZ-LD5-65SE-UNV-L930-SQP-CD1-U

### Luminous Intensity Polar Plot



TEST NUMBER: P983151

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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  |
| RCR |     |     |     |     |     |     |     |     |     |     |     |  |     |     |     |  |     |
| 0   | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 |  | 106 | 106 | 106 |  | 102 |
| 1   | 108 | 103 | 99  | 95  | 105 | 101 | 97  | 93  | 97  | 93  | 90  |  | 93  | 90  | 87  |  | 89  |
| 2   | 98  | 89  | 82  | 76  | 95  | 87  | 81  | 75  | 84  | 78  | 73  |  | 80  | 76  | 71  |  | 77  |
| 3   | 89  | 78  | 69  | 62  | 86  | 76  | 68  | 62  | 73  | 66  | 61  |  | 70  | 64  | 59  |  | 68  |
| 4   | 81  | 68  | 59  | 52  | 79  | 67  | 58  | 52  | 64  | 57  | 51  |  | 62  | 56  | 50  |  | 60  |
| 5   | 74  | 61  | 52  | 45  | 72  | 60  | 51  | 44  | 58  | 50  | 44  |  | 56  | 49  | 43  |  | 54  |
| 6   | 68  | 55  | 45  | 39  | 66  | 54  | 45  | 39  | 52  | 44  | 38  |  | 50  | 43  | 38  |  | 48  |
| 7   | 63  | 49  | 40  | 34  | 62  | 49  | 40  | 34  | 47  | 39  | 34  |  | 45  | 39  | 33  |  | 44  |
| 8   | 59  | 45  | 36  | 30  | 57  | 44  | 36  | 30  | 43  | 35  | 30  |  | 42  | 35  | 30  |  | 40  |
| 9   | 55  | 41  | 33  | 27  | 54  | 41  | 33  | 27  | 39  | 32  | 27  |  | 38  | 32  | 27  |  | 37  |
| 10  | 51  | 38  | 30  | 24  | 50  | 37  | 30  | 24  | 36  | 29  | 24  |  | 35  | 29  | 24  |  | 35  |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 2020 | 2020 | 2020 |
| 5°  | 2023 | 2038 | 2013 |
| 10° | 2016 | 2016 | 2016 |
| 15° | 2010 | 2020 | 2030 |
| 20° | 2003 | 2024 | 2034 |
| 25° | 1978 | 2011 | 2038 |
| 30° | 1962 | 1996 | 2053 |
| 35° | 1942 | 1996 | 2080 |
| 40° | 1921 | 1999 | 2128 |
| 45° | 1886 | 2005 | 2207 |
| 50° | 1844 | 2021 | 2313 |
| 55° | 1783 | 2075 | 2437 |
| 60° | 1699 | 2134 | 2578 |
| 65° | 1601 | 2209 | 2723 |
| 70° | 1430 | 2268 | 2845 |
| 75° | 1240 | 2271 | 2252 |
| 80° | 1052 | 1678 | 1820 |
| 85° | 906  | 1133 | 1019 |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 90°

Vertical Angle: 70°

Luminance: 2845 cd/sqm

TEST NUMBER: P983151

CATALOG NUMBER: 24CZ-LD5-65SE-UNV-L930-SQP-CD1-U

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 142.5  | 3.0       |
| 10°-20°   | 409.4  | 8.7       |
| 20°-30°   | 623.9  | 13.2      |
| 30°-40°   | 763.3  | 16.1      |
| 40°-50°   | 821.3  | 17.4      |
| 50°-60°   | 795.6  | 16.8      |
| 60°-70°   | 674.0  | 14.3      |
| 70°-80°   | 407.4  | 8.6       |
| 80°-90°   | 89.5   | 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°    | 1175.8 | 24.9      |
| 0°-40°    | 1939.1 | 41.0      |
| 0°-60°    | 3556.1 | 75.2      |
| 0°-90°    | 4726.9 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 4726.9 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|-----|------|-------|------|-------|------|------|
| 0°  | 1501 | 1501  | 1501 | 1501  | 1501 |      |
| 5°  | 1498 | 1498  | 1509 | 1501  | 1490 | 142  |
| 15° | 1443 | 1446  | 1450 | 1454  | 1457 | 407  |
| 25° | 1332 | 1340  | 1354 | 1366  | 1373 | 615  |
| 35° | 1182 | 1189  | 1215 | 1248  | 1266 | 739  |
| 45° | 991  | 1010  | 1054 | 1120  | 1160 | 764  |
| 55° | 760  | 793   | 885  | 988   | 1039 | 679  |
| 65° | 503  | 558   | 694  | 804   | 855  | 495  |
| 75° | 239  | 323   | 437  | 444   | 433  | 256  |
| 85° | 59   | 70    | 73   | 70    | 66   | 66   |
| 90° | 0    | 0     | 0    | 0     | 0    |      |

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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|-------|--------|--------|--------|--------|--------|
| 0°    | 1501.4 | 1501.4 | 1501.4 | 1501.4 | 1501.4 |
| 2.5°  | 1519.8 | 1516.1 | 1505.1 | 1497.8 | 1490.4 |
| 5°    | 1497.8 | 1497.8 | 1508.7 | 1501.4 | 1490.4 |
| 7.5°  | 1486.7 | 1486.7 | 1486.7 | 1505.1 | 1486.7 |
| 10°   | 1475.7 | 1479.4 | 1475.7 | 1490.4 | 1475.7 |
| 12.5° | 1464.7 | 1464.7 | 1464.7 | 1468.3 | 1468.3 |
| 15°   | 1442.7 | 1446.3 | 1450.0 | 1453.6 | 1457.4 |
| 17.5° | 1420.7 | 1424.3 | 1431.6 | 1435.4 | 1439.0 |
| 20°   | 1398.6 | 1402.3 | 1413.3 | 1413.3 | 1420.7 |
| 22.5° | 1369.2 | 1369.2 | 1383.9 | 1387.6 | 1398.6 |
| 25°   | 1332.5 | 1339.9 | 1354.5 | 1365.6 | 1372.9 |
| 27.5° | 1299.5 | 1306.8 | 1321.6 | 1336.2 | 1347.2 |
| 30°   | 1262.8 | 1270.1 | 1284.8 | 1306.8 | 1321.6 |
| 32.5° | 1222.4 | 1229.8 | 1251.8 | 1277.4 | 1292.1 |
| 35°   | 1182.1 | 1189.4 | 1215.0 | 1248.1 | 1266.5 |
| 37.5° | 1138.0 | 1149.0 | 1178.3 | 1215.0 | 1237.1 |
| 40°   | 1093.9 | 1105.0 | 1138.0 | 1178.3 | 1211.4 |
| 42.5° | 1042.5 | 1057.2 | 1093.9 | 1149.0 | 1185.7 |
| 45°   | 991.2  | 1009.5 | 1053.6 | 1119.6 | 1160.0 |
| 47.5° | 936.1  | 954.4  | 1005.9 | 1090.3 | 1134.3 |
| 50°   | 881.0  | 903.0  | 965.4  | 1057.2 | 1105.0 |
| 52.5° | 822.3  | 844.3  | 925.0  | 1024.1 | 1075.6 |
| 55°   | 759.9  | 792.9  | 884.7  | 987.5  | 1038.8 |
| 57.5° | 697.5  | 734.2  | 837.0  | 947.1  | 1002.1 |
| 60°   | 631.4  | 675.5  | 792.9  | 903.0  | 958.1  |
| 62.5° | 569.0  | 616.7  | 745.2  | 855.3  | 910.4  |
| 65°   | 502.9  | 558.0  | 693.8  | 803.9  | 855.3  |
| 67.5° | 433.1  | 502.9  | 635.1  | 741.5  | 792.9  |
| 70°   | 363.5  | 444.2  | 576.4  | 675.5  | 723.2  |
| 72.5° | 301.0  | 385.5  | 510.2  | 594.6  | 594.6  |
| 75°   | 238.6  | 323.1  | 436.8  | 444.2  | 433.1  |
| 77.5° | 183.5  | 264.3  | 341.3  | 312.0  | 319.3  |
| 80°   | 135.8  | 201.9  | 216.6  | 227.6  | 234.9  |
| 82.5° | 91.8   | 135.8  | 139.5  | 146.9  | 146.9  |
| 85°   | 58.7   | 69.8   | 73.4   | 69.8   | 66.0   |
| 87.5° | 25.7   | 29.4   | 22.0   | 14.7   | 11.1   |
| 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: SP3-2508-516-5

Test Date: 09/03/2025

Luminaire Tested: 24CZ-LD5-65-S-UNV-L930-CD1-U

Data in this report applies to families of products including 24CZ-LD5-65-S-UNV-L930-CD1-U

### Test Information

Test Method: LM-79-2019  
 Report Number: SP3-2508-516-5  
 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-L930-CD1-U**  
 Description: 2X4 CRUZE SB 6500LM 930 SMOOTH LENS

### Spectral Parameters

CCT (K): 2988  
 CIE  $u'$ : 0.2517  
 CIE  $v'$ : 0.5189  
 Duv: -0.0019  
 CIE x: 0.4350  
 CIE y: 0.3986  
 CIE z: 0.1665  
 Peak Wavelength (nm): 630  
 Dominant Wavelength (nm): 583  
 Purity: 50.17903  
 R<sub>f</sub>: 91.6  
 R<sub>g</sub>: 101.1

CRI (Ra): 94.3  
 R1: 96.3  
 R2: 97.6  
 R3: 97.5  
 R4: 95.8  
 R5: 96.1  
 R6: 96.2  
 R7: 91.6  
 R8: 83.5  
 R9: 61.9  
 R10: 93.0  
 R11: 96.3  
 R12: 85.8  
 R13: 96.7  
 R14: 97.5  
 R15: 91.8



### Test Conditions

Stabilization Time: 21M  
 Operation Time: 1H 21M  
 Sphere Temperature (°C): 25.0

REPORT NUMBER: SP3-2508-516-5

| 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**



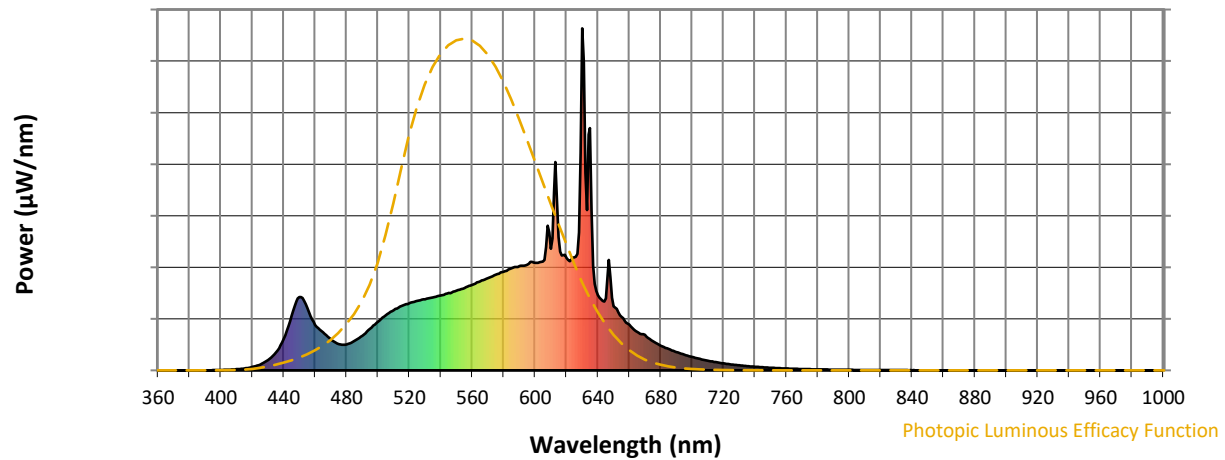
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 3000K 4-step quadrangle

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### 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    | 101                      | NR            | 620    | 329                      | NR            | 750    | 8                        | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 121                      | NR            | 625    | 331                      | NR            | 755    | 7                        | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 143                      | NR            | 630    | 1000                     | NR            | 760    | 6                        | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 161                      | NR            | 635    | 709                      | NR            | 765    | 5                        | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 176                      | NR            | 640    | 220                      | NR            | 770    | 4                        | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 189                      | NR            | 645    | 210                      | NR            | 775    | 3                        | NR            | 905    | 0                        | NR            |
| 390    | 0                        | NR            | 520    | 196                      | NR            | 650    | 188                      | NR            | 780    | 3                        | NR            | 910    | 0                        | NR            |
| 395    | 1                        | NR            | 525    | 203                      | NR            | 655    | 156                      | NR            | 785    | 2                        | NR            | 915    | 0                        | NR            |
| 400    | 1                        | NR            | 530    | 208                      | NR            | 660    | 134                      | NR            | 790    | 2                        | NR            | 920    | 0                        | NR            |
| 405    | 2                        | NR            | 535    | 213                      | NR            | 665    | 112                      | NR            | 795    | 2                        | NR            | 925    | 0                        | NR            |
| 410    | 3                        | NR            | 540    | 219                      | NR            | 670    | 104                      | NR            | 800    | 1                        | NR            | 930    | 0                        | NR            |
| 415    | 6                        | NR            | 545    | 226                      | NR            | 675    | 85                       | NR            | 805    | 1                        | NR            | 935    | 0                        | NR            |
| 420    | 10                       | NR            | 550    | 233                      | NR            | 680    | 72                       | NR            | 810    | 1                        | NR            | 940    | 0                        | NR            |
| 425    | 17                       | NR            | 555    | 241                      | NR            | 685    | 63                       | NR            | 815    | 1                        | NR            | 945    | 0                        | NR            |
| 430    | 30                       | NR            | 560    | 250                      | NR            | 690    | 53                       | NR            | 820    | 1                        | NR            | 950    | 0                        | NR            |
| 435    | 53                       | NR            | 565    | 260                      | NR            | 695    | 46                       | NR            | 825    | 1                        | NR            | 955    | 0                        | NR            |
| 440    | 92                       | NR            | 570    | 270                      | NR            | 700    | 39                       | NR            | 830    | 1                        | NR            | 960    | 0                        | NR            |
| 445    | 160                      | NR            | 575    | 280                      | NR            | 705    | 33                       | NR            | 835    | 1                        | NR            | 965    | 0                        | NR            |
| 450    | 214                      | NR            | 580    | 289                      | NR            | 710    | 28                       | NR            | 840    | 0                        | NR            | 970    | 0                        | NR            |
| 455    | 183                      | NR            | 585    | 298                      | NR            | 715    | 24                       | NR            | 845    | 0                        | NR            | 975    | 0                        | NR            |
| 460    | 133                      | NR            | 590    | 305                      | NR            | 720    | 20                       | NR            | 850    | 0                        | NR            | 980    | 0                        | NR            |
| 465    | 111                      | NR            | 595    | 309                      | NR            | 725    | 17                       | NR            | 855    | 0                        | NR            | 985    | 0                        | NR            |
| 470    | 91                       | NR            | 600    | 314                      | NR            | 730    | 15                       | NR            | 860    | 0                        | NR            | 990    | 0                        | NR            |
| 475    | 77                       | NR            | 605    | 318                      | NR            | 735    | 13                       | NR            | 865    | 0                        | NR            | 995    | 0                        | NR            |
| 480    | 76                       | NR            | 610    | 356                      | NR            | 740    | 11                       | NR            | 870    | 0                        | NR            | 1000   | 0                        | NR            |
| 485    | 86                       | NR            | 615    | 390                      | NR            | 745    | 9                        | NR            | 875    | 0                        | NR            |        |                          |               |

REPORT NUMBER: SP3-2508-516-5

### Scotopic Flux vs. Wavelength



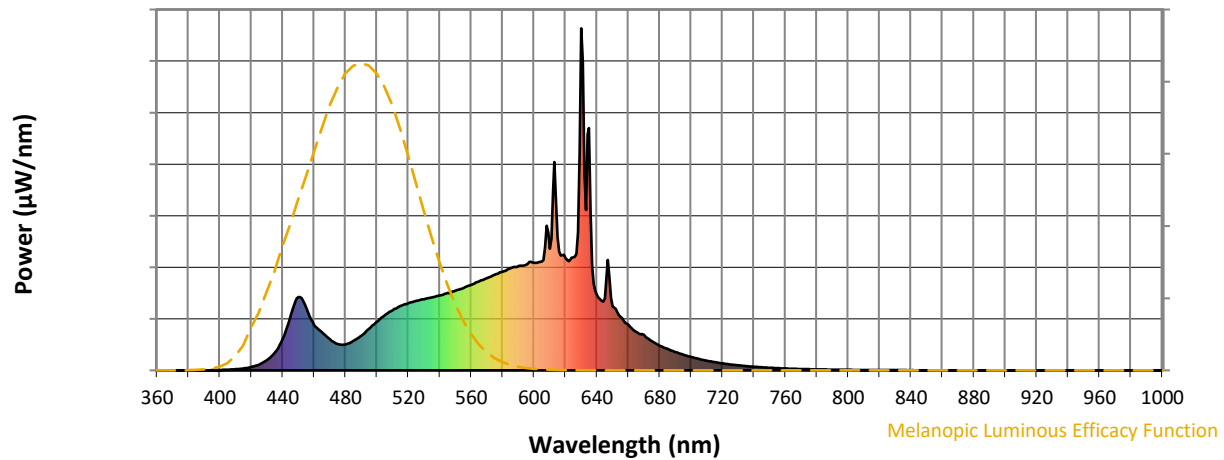
Scotopic Lumens: NR

S/P: 1.43

| $\lambda$<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               | 101                                  | NR                             | 620               | 329                                  | NR                             | 750               | 8                                    | NR                             | 880               | 0                                    | NR                             |
| 365               | 0                                    | NR                             | 495               | 121                                  | NR                             | 625               | 331                                  | NR                             | 755               | 7                                    | NR                             | 885               | 0                                    | NR                             |
| 370               | 0                                    | NR                             | 500               | 143                                  | NR                             | 630               | 1000                                 | NR                             | 760               | 6                                    | NR                             | 890               | 0                                    | NR                             |
| 375               | 0                                    | NR                             | 505               | 161                                  | NR                             | 635               | 709                                  | NR                             | 765               | 5                                    | NR                             | 895               | 0                                    | NR                             |
| 380               | 0                                    | NR                             | 510               | 176                                  | NR                             | 640               | 220                                  | NR                             | 770               | 4                                    | NR                             | 900               | 0                                    | NR                             |
| 385               | 0                                    | NR                             | 515               | 189                                  | NR                             | 645               | 210                                  | NR                             | 775               | 3                                    | NR                             | 905               | 0                                    | NR                             |
| 390               | 0                                    | NR                             | 520               | 196                                  | NR                             | 650               | 188                                  | NR                             | 780               | 3                                    | NR                             | 910               | 0                                    | NR                             |
| 395               | 1                                    | NR                             | 525               | 203                                  | NR                             | 655               | 156                                  | NR                             | 785               | 2                                    | NR                             | 915               | 0                                    | NR                             |
| 400               | 1                                    | NR                             | 530               | 208                                  | NR                             | 660               | 134                                  | NR                             | 790               | 2                                    | NR                             | 920               | 0                                    | NR                             |
| 405               | 2                                    | NR                             | 535               | 213                                  | NR                             | 665               | 112                                  | NR                             | 795               | 2                                    | NR                             | 925               | 0                                    | NR                             |
| 410               | 3                                    | NR                             | 540               | 219                                  | NR                             | 670               | 104                                  | NR                             | 800               | 1                                    | NR                             | 930               | 0                                    | NR                             |
| 415               | 6                                    | NR                             | 545               | 226                                  | NR                             | 675               | 85                                   | NR                             | 805               | 1                                    | NR                             | 935               | 0                                    | NR                             |
| 420               | 10                                   | NR                             | 550               | 233                                  | NR                             | 680               | 72                                   | NR                             | 810               | 1                                    | NR                             | 940               | 0                                    | NR                             |
| 425               | 17                                   | NR                             | 555               | 241                                  | NR                             | 685               | 63                                   | NR                             | 815               | 1                                    | NR                             | 945               | 0                                    | NR                             |
| 430               | 30                                   | NR                             | 560               | 250                                  | NR                             | 690               | 53                                   | NR                             | 820               | 1                                    | NR                             | 950               | 0                                    | NR                             |
| 435               | 53                                   | NR                             | 565               | 260                                  | NR                             | 695               | 46                                   | NR                             | 825               | 1                                    | NR                             | 955               | 0                                    | NR                             |
| 440               | 92                                   | NR                             | 570               | 270                                  | NR                             | 700               | 39                                   | NR                             | 830               | 1                                    | NR                             | 960               | 0                                    | NR                             |
| 445               | 160                                  | NR                             | 575               | 280                                  | NR                             | 705               | 33                                   | NR                             | 835               | 1                                    | NR                             | 965               | 0                                    | NR                             |
| 450               | 214                                  | NR                             | 580               | 289                                  | NR                             | 710               | 28                                   | NR                             | 840               | 0                                    | NR                             | 970               | 0                                    | NR                             |
| 455               | 183                                  | NR                             | 585               | 298                                  | NR                             | 715               | 24                                   | NR                             | 845               | 0                                    | NR                             | 975               | 0                                    | NR                             |
| 460               | 133                                  | NR                             | 590               | 305                                  | NR                             | 720               | 20                                   | NR                             | 850               | 0                                    | NR                             | 980               | 0                                    | NR                             |
| 465               | 111                                  | NR                             | 595               | 309                                  | NR                             | 725               | 17                                   | NR                             | 855               | 0                                    | NR                             | 985               | 0                                    | NR                             |
| 470               | 91                                   | NR                             | 600               | 314                                  | NR                             | 730               | 15                                   | NR                             | 860               | 0                                    | NR                             | 990               | 0                                    | NR                             |
| 475               | 77                                   | NR                             | 605               | 318                                  | NR                             | 735               | 13                                   | NR                             | 865               | 0                                    | NR                             | 995               | 0                                    | NR                             |
| 480               | 76                                   | NR                             | 610               | 356                                  | NR                             | 740               | 11                                   | NR                             | 870               | 0                                    | NR                             | 1000              | 0                                    | NR                             |
| 485               | 86                                   | NR                             | 615               | 390                                  | NR                             | 745               | 9                                    | NR                             | 875               | 0                                    | NR                             |                   |                                      |                                |

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### Melanopic Flux vs. Wavelength



Melanopic Lumens: NR

M/P: 2.8

| 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       | 101                         | NR               | 620       | 329                         | NR               | 750       | 8                           | NR               | 880       | 0                           | NR               |
| 365       | 0                           | NR               | 495       | 121                         | NR               | 625       | 331                         | NR               | 755       | 7                           | NR               | 885       | 0                           | NR               |
| 370       | 0                           | NR               | 500       | 143                         | NR               | 630       | 1000                        | NR               | 760       | 6                           | NR               | 890       | 0                           | NR               |
| 375       | 0                           | NR               | 505       | 161                         | NR               | 635       | 709                         | NR               | 765       | 5                           | NR               | 895       | 0                           | NR               |
| 380       | 0                           | NR               | 510       | 176                         | NR               | 640       | 220                         | NR               | 770       | 4                           | NR               | 900       | 0                           | NR               |
| 385       | 0                           | NR               | 515       | 189                         | NR               | 645       | 210                         | NR               | 775       | 3                           | NR               | 905       | 0                           | NR               |
| 390       | 0                           | NR               | 520       | 196                         | NR               | 650       | 188                         | NR               | 780       | 3                           | NR               | 910       | 0                           | NR               |
| 395       | 1                           | NR               | 525       | 203                         | NR               | 655       | 156                         | NR               | 785       | 2                           | NR               | 915       | 0                           | NR               |
| 400       | 1                           | NR               | 530       | 208                         | NR               | 660       | 134                         | NR               | 790       | 2                           | NR               | 920       | 0                           | NR               |
| 405       | 2                           | NR               | 535       | 213                         | NR               | 665       | 112                         | NR               | 795       | 2                           | NR               | 925       | 0                           | NR               |
| 410       | 3                           | NR               | 540       | 219                         | NR               | 670       | 104                         | NR               | 800       | 1                           | NR               | 930       | 0                           | NR               |
| 415       | 6                           | NR               | 545       | 226                         | NR               | 675       | 85                          | NR               | 805       | 1                           | NR               | 935       | 0                           | NR               |
| 420       | 10                          | NR               | 550       | 233                         | NR               | 680       | 72                          | NR               | 810       | 1                           | NR               | 940       | 0                           | NR               |
| 425       | 17                          | NR               | 555       | 241                         | NR               | 685       | 63                          | NR               | 815       | 1                           | NR               | 945       | 0                           | NR               |
| 430       | 30                          | NR               | 560       | 250                         | NR               | 690       | 53                          | NR               | 820       | 1                           | NR               | 950       | 0                           | NR               |
| 435       | 53                          | NR               | 565       | 260                         | NR               | 695       | 46                          | NR               | 825       | 1                           | NR               | 955       | 0                           | NR               |
| 440       | 92                          | NR               | 570       | 270                         | NR               | 700       | 39                          | NR               | 830       | 1                           | NR               | 960       | 0                           | NR               |
| 445       | 160                         | NR               | 575       | 280                         | NR               | 705       | 33                          | NR               | 835       | 1                           | NR               | 965       | 0                           | NR               |
| 450       | 214                         | NR               | 580       | 289                         | NR               | 710       | 28                          | NR               | 840       | 0                           | NR               | 970       | 0                           | NR               |
| 455       | 183                         | NR               | 585       | 298                         | NR               | 715       | 24                          | NR               | 845       | 0                           | NR               | 975       | 0                           | NR               |
| 460       | 133                         | NR               | 590       | 305                         | NR               | 720       | 20                          | NR               | 850       | 0                           | NR               | 980       | 0                           | NR               |
| 465       | 111                         | NR               | 595       | 309                         | NR               | 725       | 17                          | NR               | 855       | 0                           | NR               | 985       | 0                           | NR               |
| 470       | 91                          | NR               | 600       | 314                         | NR               | 730       | 15                          | NR               | 860       | 0                           | NR               | 990       | 0                           | NR               |
| 475       | 77                          | NR               | 605       | 318                         | NR               | 735       | 13                          | NR               | 865       | 0                           | NR               | 995       | 0                           | NR               |
| 480       | 76                          | NR               | 610       | 356                         | NR               | 740       | 11                          | NR               | 870       | 0                           | NR               | 1000      | 0                           | NR               |
| 485       | 86                          | NR               | 615       | 390                         | NR               | 745       | 9                           | NR               | 875       | 0                           | NR               |           |                             |                  |

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TM-30-18

### Summary

$R_f = 91.6$   
 $R_g = 101.1$   
 CIE  $R_a = 94.3$   
 $R_9 = 61.9$



### Color Vector Graphics



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

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 92 | CES51 = 97 | CES76 = 89 |
| CES02 = 63 | CES27 = 95 | CES52 = 96 | CES77 = 85 |
| CES03 = 32 | CES28 = 96 | CES53 = 94 | CES78 = 86 |
| CES04 = 70 | CES29 = 92 | CES54 = 97 | CES79 = 89 |
| CES05 = 51 | CES30 = 99 | CES55 = 96 | CES80 = 91 |
| CES06 = 51 | CES31 = 93 | CES56 = 96 | CES81 = 72 |
| CES07 = 44 | CES32 = 85 | CES57 = 96 | CES82 = 96 |
| CES08 = 42 | CES33 = 94 | CES58 = 96 | CES83 = 93 |
| CES09 = 29 | CES34 = 93 | CES59 = 99 | CES84 = 96 |
| CES10 = 76 | CES35 = 96 | CES60 = 95 | CES85 = 80 |
| CES11 = 59 | CES36 = 87 | CES61 = 95 | CES86 = 78 |
| CES12 = 65 | CES37 = 94 | CES62 = 93 | CES87 = 91 |
| CES13 = 44 | CES38 = 96 | CES63 = 94 | CES88 = 97 |
| CES14 = 74 | CES39 = 98 | CES64 = 95 | CES89 = 82 |
| CES15 = 72 | CES40 = 95 | CES65 = 91 | CES90 = 98 |
| CES16 = 48 | CES41 = 96 | CES66 = 93 | CES91 = 81 |
| CES17 = 50 | CES42 = 92 | CES67 = 92 | CES92 = 78 |
| CES18 = 57 | CES43 = 90 | CES68 = 92 | CES93 = 87 |
| CES19 = 72 | CES44 = 99 | CES69 = 93 | CES94 = 73 |
| CES20 = 67 | CES45 = 94 | CES70 = 89 | CES95 = 85 |
| CES21 = 86 | CES46 = 94 | CES71 = 88 | CES96 = 92 |
| CES22 = 79 | CES47 = 88 | CES72 = 95 | CES97 = 94 |
| CES23 = 92 | CES48 = 95 | CES73 = 85 | CES98 = 94 |
| CES24 = 91 | CES49 = 92 | CES74 = 90 | CES99 = 93 |
| CES25 = 72 | CES50 = 97 | CES75 = 88 |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)