

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: P982900

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

Issue Date: 04/23/2025

**Test Information**

Test Method: LM-79-2019  
Report Number: P982900  
Test Lab: INNOVATION CENTER(P3)  
Issue Date: 04/23/2025  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: METALUX  
Catalog Number: 24CZ-LD5-70-UNV-L840-CD1-U  
Description: METALUX CRUZE 2x4 7000LM PACKAGE 80CRI 4000K TROFFER STANDARD LENS  
Light Source: 4000K CCT, 80 CRI LEDS  
Ballast/Driver: -

**Summary**

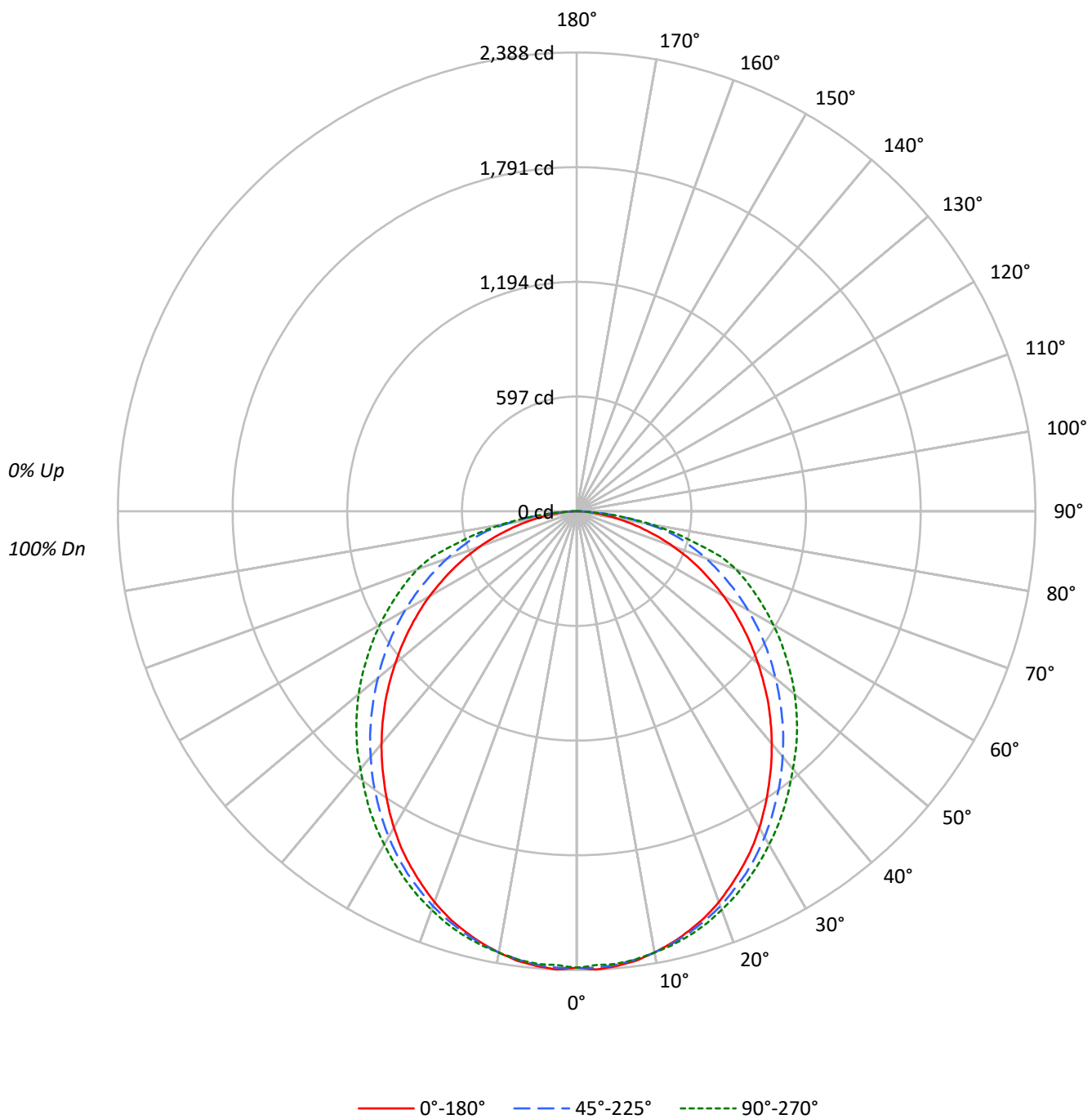
Lumens per Lamp: N/A  
Luminaire Lumens: 6762.0 lumens  
Efficiency: N/A  
Efficacy: 137.2 lumens/watt  
Spacing Criteria (0/90/45): 1.19 / 1.26 / 1.35  
Luminous Opening: Rectangular (W 2' x L: 4' x H: 0')  
CIE Type: Direct

Input Watts (W): 49.3  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT

TEST NUMBER: P982900

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

### Luminous Intensity Polar Plot



TEST NUMBER: P982900

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

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 3197 | 3197 | 3197 |
| 5°  | 3209 | 3200 | 3194 |
| 10° | 3187 | 3187 | 3187 |
| 15° | 3150 | 3163 | 3182 |
| 20° | 3099 | 3132 | 3162 |
| 25° | 3033 | 3091 | 3138 |
| 30° | 2956 | 3041 | 3113 |
| 35° | 2864 | 2985 | 3095 |
| 40° | 2776 | 2929 | 3075 |
| 45° | 2683 | 2876 | 3086 |
| 50° | 2581 | 2826 | 3101 |
| 55° | 2482 | 2795 | 3124 |
| 60° | 2377 | 2773 | 3182 |
| 65° | 2256 | 2769 | 3281 |
| 70° | 2100 | 2814 | 3466 |
| 75° | 1878 | 2929 | 3324 |
| 80° | 1604 | 2799 | 3048 |
| 85° | 1243 | 2237 | 2130 |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 90°  
Vertical Angle: 72.5°  
Luminance: 3530 cd/sqm

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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 224.7  | 3.3       |
| 10°-20°   | 639.6  | 9.5       |
| 20°-30°   | 956.1  | 14.1      |
| 30°-40°   | 1133.7 | 16.8      |
| 40°-50°   | 1165.9 | 17.2      |
| 50°-60°   | 1066.4 | 15.8      |
| 60°-70°   | 860.1  | 12.7      |
| 70°-80°   | 558.4  | 8.3       |
| 80°-90°   | 157.1  | 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°    | 1820.4 | 26.9      |
| 0°-40°    | 2954.0 | 43.7      |
| 0°-60°    | 5186.3 | 76.7      |
| 0°-90°    | 6762.0 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 6762.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|-----|------|-------|------|-------|------|------|
| 0°  | 2376 | 2376  | 2376 | 2376  | 2376 |      |
| 5°  | 2376 | 2360  | 2369 | 2365  | 2365 | 225  |
| 15° | 2261 | 2250  | 2270 | 2280  | 2284 | 637  |
| 25° | 2043 | 2043  | 2082 | 2098  | 2114 | 940  |
| 35° | 1744 | 1760  | 1817 | 1854  | 1884 | 1091 |
| 45° | 1410 | 1435  | 1511 | 1580  | 1622 | 1087 |
| 55° | 1058 | 1093  | 1192 | 1286  | 1332 | 946  |
| 65° | 708  | 750   | 870  | 982   | 1030 | 700  |
| 75° | 361  | 428   | 564  | 633   | 640  | 385  |
| 85° | 80   | 133   | 145  | 143   | 138  | 97   |
| 90° | 0    | 0     | 0    | 0     | 0    |      |

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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|-------|--------|--------|--------|--------|--------|
| 0°    | 2376.2 | 2376.2 | 2376.2 | 2376.2 | 2376.2 |
| 2.5°  | 2387.8 | 2369.4 | 2378.6 | 2374.0 | 2364.8 |
| 5°    | 2376.2 | 2360.2 | 2369.4 | 2364.8 | 2364.8 |
| 7.5°  | 2360.2 | 2344.0 | 2353.2 | 2353.2 | 2353.2 |
| 10°   | 2332.5 | 2318.7 | 2332.5 | 2332.5 | 2332.5 |
| 12.5° | 2300.3 | 2288.8 | 2304.9 | 2307.3 | 2311.9 |
| 15°   | 2261.2 | 2249.8 | 2270.4 | 2279.6 | 2284.2 |
| 17.5° | 2217.5 | 2208.3 | 2231.3 | 2242.8 | 2249.8 |
| 20°   | 2164.6 | 2157.7 | 2187.6 | 2199.1 | 2208.3 |
| 22.5° | 2104.8 | 2104.8 | 2134.7 | 2148.5 | 2164.6 |
| 25°   | 2042.7 | 2042.7 | 2081.8 | 2097.9 | 2114.0 |
| 27.5° | 1976.0 | 1978.3 | 2022.0 | 2045.0 | 2061.1 |
| 30°   | 1902.4 | 1911.6 | 1957.6 | 1985.2 | 2003.6 |
| 32.5° | 1824.1 | 1835.7 | 1888.6 | 1923.1 | 1946.1 |
| 35°   | 1743.6 | 1759.8 | 1817.3 | 1854.0 | 1884.0 |
| 37.5° | 1663.1 | 1683.9 | 1746.0 | 1787.3 | 1817.3 |
| 40°   | 1580.3 | 1603.3 | 1667.7 | 1716.0 | 1750.6 |
| 42.5° | 1495.2 | 1520.5 | 1591.8 | 1647.0 | 1688.5 |
| 45°   | 1410.1 | 1435.4 | 1511.3 | 1580.3 | 1621.8 |
| 47.5° | 1320.4 | 1350.3 | 1430.8 | 1511.3 | 1552.7 |
| 50°   | 1233.0 | 1265.2 | 1350.3 | 1437.7 | 1481.4 |
| 52.5° | 1145.6 | 1182.3 | 1272.1 | 1364.1 | 1407.8 |
| 55°   | 1058.1 | 1092.6 | 1191.5 | 1285.9 | 1331.9 |
| 57.5° | 970.7  | 1007.6 | 1111.0 | 1210.0 | 1258.3 |
| 60°   | 883.4  | 922.5  | 1030.5 | 1134.0 | 1182.3 |
| 62.5° | 793.6  | 835.0  | 950.1  | 1058.1 | 1106.4 |
| 65°   | 708.5  | 749.9  | 869.6  | 982.2  | 1030.5 |
| 67.5° | 621.0  | 667.1  | 791.3  | 906.3  | 956.9  |
| 70°   | 533.7  | 584.3  | 715.4  | 830.4  | 881.0  |
| 72.5° | 446.3  | 503.8  | 637.2  | 752.2  | 789.0  |
| 75°   | 361.2  | 427.9  | 563.5  | 632.6  | 639.5  |
| 77.5° | 282.9  | 352.0  | 480.8  | 508.4  | 522.2  |
| 80°   | 207.0  | 282.9  | 361.2  | 395.6  | 393.4  |
| 82.5° | 138.0  | 216.2  | 260.0  | 264.6  | 260.0  |
| 85°   | 80.5   | 133.4  | 144.9  | 142.6  | 138.0  |
| 87.5° | 34.5   | 52.9   | 46.0   | 39.1   | 32.2   |
| 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**



REPORT NUMBER: SP3-2508-516-7

### 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               | 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

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

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### 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)