

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: P982568

Luminaire Tested: 14CZ-LD5-20-UNV-L840-S-CD1-U

Issue Date: 04/23/2025

**Test Information**

Test Method: LM-79-2019  
Report Number: P982568  
Test Lab: INNOVATION CENTER(P3)  
Issue Date: 04/23/2025  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: METALUX  
Catalog Number: 14CZ-LD5-20-UNV-L840-S-CD1-U  
Description: METALUX CRUZE 1x4 2000LM PACKAGE 80CRI 4000K TROFFER SMOOTH LENS  
Light Source: 4000K CCT, 80 CRI LEDS  
Ballast/Driver: -

**Summary**

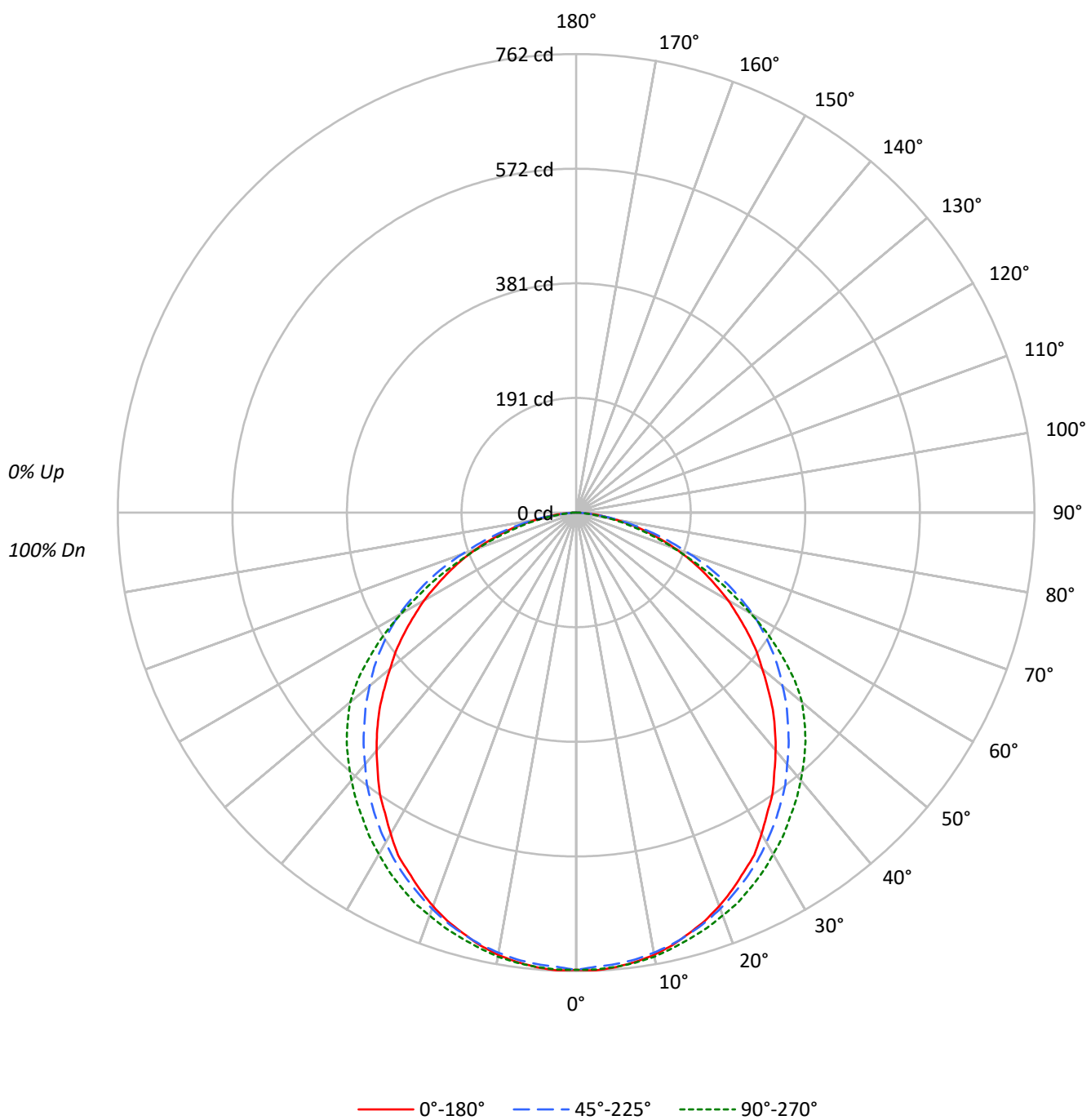
Lumens per Lamp: N/A  
Luminaire Lumens: 2107.5 lumens  
Efficiency: N/A  
Efficacy: 135.1 lumens/watt  
Spacing Criteria (0/90/45): 1.21 / 1.28 / 1.37  
Luminous Opening: Rectangular (W 1' x L: 4' x H: 0')  
CIE Type: Direct

Input Watts (W): 15.6  
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: 14CZ-LD5-20-UNV-L840-S-CD1-U

### Luminous Intensity Polar Plot



TEST NUMBER: P982568

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

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| RF  | 20  |     |     |     | 20  |     |     |     |     | 20  |     |     |     |     | 20  |     |     |     |     | 20  |
| RC  | 80  |     |     |     | 70  |     |     |     |     | 50  |     |     |     |     | 30  |     |     |     |     | 10  |
| RW  | 70  | 50  | 30  | 10  | 70  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  |
| RCR |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 0   | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 | 106 | 106 | 106 | 102 | 102 | 102 | 102 | 102 | 100 |
| 1   | 109 | 104 | 100 | 96  | 106 | 102 | 98  | 95  | 98  | 95  | 92  | 94  | 91  | 89  | 90  | 88  | 86  | 86  | 86  | 84  |
| 2   | 99  | 91  | 84  | 79  | 97  | 89  | 83  | 78  | 86  | 80  | 76  | 82  | 78  | 74  | 79  | 76  | 73  | 73  | 73  | 70  |
| 3   | 90  | 80  | 72  | 66  | 88  | 78  | 71  | 65  | 75  | 69  | 64  | 73  | 67  | 63  | 70  | 66  | 62  | 62  | 62  | 59  |
| 4   | 83  | 71  | 62  | 56  | 81  | 70  | 61  | 55  | 67  | 60  | 54  | 65  | 59  | 54  | 63  | 57  | 53  | 53  | 53  | 51  |
| 5   | 76  | 63  | 54  | 48  | 74  | 62  | 54  | 48  | 60  | 53  | 47  | 58  | 52  | 46  | 56  | 51  | 46  | 46  | 46  | 44  |
| 6   | 70  | 57  | 48  | 42  | 68  | 56  | 48  | 42  | 54  | 47  | 41  | 53  | 46  | 41  | 51  | 45  | 40  | 40  | 40  | 38  |
| 7   | 65  | 52  | 43  | 37  | 63  | 51  | 43  | 37  | 49  | 42  | 36  | 48  | 41  | 36  | 47  | 40  | 36  | 36  | 36  | 34  |
| 8   | 61  | 47  | 39  | 33  | 59  | 46  | 38  | 33  | 45  | 38  | 33  | 44  | 37  | 32  | 43  | 37  | 32  | 32  | 32  | 30  |
| 9   | 57  | 43  | 35  | 30  | 55  | 43  | 35  | 29  | 42  | 34  | 29  | 40  | 34  | 29  | 39  | 33  | 29  | 29  | 29  | 27  |
| 10  | 53  | 40  | 32  | 27  | 52  | 39  | 32  | 27  | 38  | 31  | 27  | 37  | 31  | 26  | 37  | 31  | 26  | 26  | 26  | 25  |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 2045 | 2045 | 2045 |
| 5°  | 2049 | 2035 | 2048 |
| 10° | 2040 | 2030 | 2048 |
| 15° | 2018 | 2020 | 2042 |
| 20° | 1993 | 2006 | 2041 |
| 25° | 1957 | 1989 | 2041 |
| 30° | 1915 | 1967 | 2037 |
| 35° | 1871 | 1945 | 2035 |
| 40° | 1813 | 1917 | 2041 |
| 45° | 1759 | 1895 | 2052 |
| 50° | 1690 | 1876 | 2053 |
| 55° | 1634 | 1861 | 1967 |
| 60° | 1570 | 1834 | 1803 |
| 65° | 1486 | 1746 | 1605 |
| 70° | 1388 | 1586 | 1356 |
| 75° | 1252 | 1384 | 1136 |
| 80° | 1007 | 1086 | 866  |
| 85° | 716  | 624  | 451  |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 90°

Vertical Angle: 50°

Luminance: 2053 cd/sqm

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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 71.9   | 3.4       |
| 10°-20°   | 205.4  | 9.7       |
| 20°-30°   | 309.9  | 14.7      |
| 30°-40°   | 371.6  | 17.6      |
| 40°-50°   | 385.6  | 18.3      |
| 50°-60°   | 348.1  | 16.5      |
| 60°-70°   | 253.6  | 12.0      |
| 70°-80°   | 133.0  | 6.3       |
| 80°-90°   | 28.4   | 1.3       |
| 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°    | 587.2  | 27.9      |
| 0°-40°    | 958.8  | 45.5      |
| 0°-60°    | 1692.6 | 80.3      |
| 0°-90°    | 2107.5 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 2107.5 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°  | 22.5° | 45° | 67.5° | 90° | Flux |
|-----|-----|-------|-----|-------|-----|------|
| 0°  | 760 | 760   | 760 | 760   | 760 |      |
| 5°  | 758 | 757   | 753 | 758   | 758 | 72   |
| 15° | 724 | 724   | 725 | 733   | 733 | 204  |
| 25° | 659 | 663   | 670 | 684   | 687 | 304  |
| 35° | 570 | 575   | 592 | 614   | 619 | 355  |
| 45° | 462 | 472   | 498 | 529   | 539 | 356  |
| 55° | 348 | 360   | 397 | 420   | 419 | 311  |
| 65° | 233 | 248   | 274 | 262   | 252 | 231  |
| 75° | 120 | 138   | 133 | 115   | 109 | 127  |
| 85° | 23  | 28    | 20  | 16    | 15  | 30   |
| 90° | 0   | 0     | 0   | 0     | 0   |      |

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**CANDELA DISTRIBUTION (FULL):**

|       | 0°    | 22.5° | 45°   | 67.5° | 90°   |
|-------|-------|-------|-------|-------|-------|
| 0°    | 760.0 | 760.0 | 760.0 | 760.0 | 760.0 |
| 2.5°  | 761.5 | 759.5 | 755.5 | 760.5 | 760.0 |
| 5°    | 758.4 | 757.0 | 753.4 | 758.4 | 758.0 |
| 7.5°  | 753.4 | 752.4 | 749.4 | 755.0 | 754.5 |
| 10°   | 746.4 | 744.9 | 742.8 | 749.0 | 749.4 |
| 12.5° | 736.8 | 736.3 | 735.3 | 741.8 | 741.3 |
| 15°   | 724.2 | 724.2 | 725.2 | 733.3 | 732.8 |
| 17.5° | 711.6 | 711.6 | 714.1 | 723.2 | 723.7 |
| 20°   | 696.0 | 697.0 | 700.6 | 711.6 | 712.6 |
| 22.5° | 678.4 | 679.4 | 685.4 | 699.5 | 702.0 |
| 25°   | 659.2 | 662.8 | 669.8 | 684.4 | 687.4 |
| 27.5° | 641.6 | 642.1 | 652.7 | 668.8 | 672.8 |
| 30°   | 616.4 | 623.4 | 633.0 | 651.7 | 655.6 |
| 32.5° | 591.6 | 598.7 | 613.3 | 633.5 | 639.0 |
| 35°   | 569.5 | 575.0 | 592.2 | 614.4 | 619.4 |
| 37.5° | 541.7 | 550.9 | 571.0 | 594.2 | 601.2 |
| 40°   | 516.0 | 524.1 | 545.8 | 572.0 | 581.0 |
| 42.5° | 489.4 | 498.4 | 523.1 | 551.3 | 560.5 |
| 45°   | 462.2 | 472.2 | 497.9 | 529.2 | 539.3 |
| 47.5° | 432.4 | 445.0 | 474.3 | 506.0 | 515.0 |
| 50°   | 403.7 | 416.8 | 448.0 | 481.3 | 490.4 |
| 52.5° | 377.5 | 389.1 | 423.3 | 454.1 | 458.1 |
| 55°   | 348.2 | 360.4 | 396.6 | 420.3 | 419.3 |
| 57.5° | 319.0 | 332.7 | 368.9 | 383.5 | 379.5 |
| 60°   | 291.8 | 304.4 | 340.7 | 343.8 | 335.1 |
| 62.5° | 261.5 | 276.2 | 306.9 | 302.4 | 291.8 |
| 65°   | 233.3 | 247.5 | 274.2 | 261.5 | 252.0 |
| 67.5° | 204.6 | 219.8 | 238.9 | 220.3 | 209.2 |
| 70°   | 176.4 | 194.5 | 201.6 | 181.5 | 172.4 |
| 72.5° | 147.6 | 166.8 | 166.3 | 147.1 | 139.6 |
| 75°   | 120.4 | 137.5 | 133.1 | 114.9 | 109.3 |
| 77.5° | 91.7  | 108.8 | 100.3 | 86.7  | 81.6  |
| 80°   | 65.0  | 81.1  | 70.1  | 59.5  | 55.9  |
| 82.5° | 44.3  | 53.9  | 43.8  | 34.7  | 33.2  |
| 85°   | 23.2  | 27.7  | 20.2  | 15.6  | 14.6  |
| 87.5° | 8.6   | 8.0   | 7.0   | 6.5   | 6.5   |
| 90°   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |

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

Report Prepared for

Cooper Lighting Solutions

Metalux

Report Number: SP3-2508-516-7

Test Date: 09/03/2025

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

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

### Test Information

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

### Spectral Parameters

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

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



### Test Conditions

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

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

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**CIE 1931 Chromaticity Diagram**



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



Point lies inside the ANSI 4000K 4-step quadrangle

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### Photopic Flux vs. Wavelength



### Photopic Lumens: NR

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

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### Scotopic Flux vs. Wavelength



Scotopic Lumens: NR

S/P: 1.77

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

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### Melanopic Flux vs. Wavelength



Melanopic Lumens: NR

M/P: 3.69

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

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TM-30-18

### Summary

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



### Color Vector Graphics



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

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



**Color Rendition by Hue-Angle Bin**


**Measure Comparisons**


(END OF REPORT)