

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: P982608

Luminaire Tested: 14CZ-LD5-39-UNV-L930-RDP-CD1-U

Issue Date: 04/23/2025

**Test Information**

Test Method: LM-79-2019  
Report Number: P982608  
Test Lab: INNOVATION CENTER(P3)  
Issue Date: 04/23/2025  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: METALUX  
Catalog Number: 14CZ-LD5-39-UNV-L930-RDP-CD1-U  
Description: METALUX CRUZE 1x4 3900LM PACKAGE 90CRI 3000K TROFFER LENS WITH RDP FILM INSERT  
Light Source: 3000K CCT, 90 CRI LEDS  
Ballast/Driver: -

**Summary**

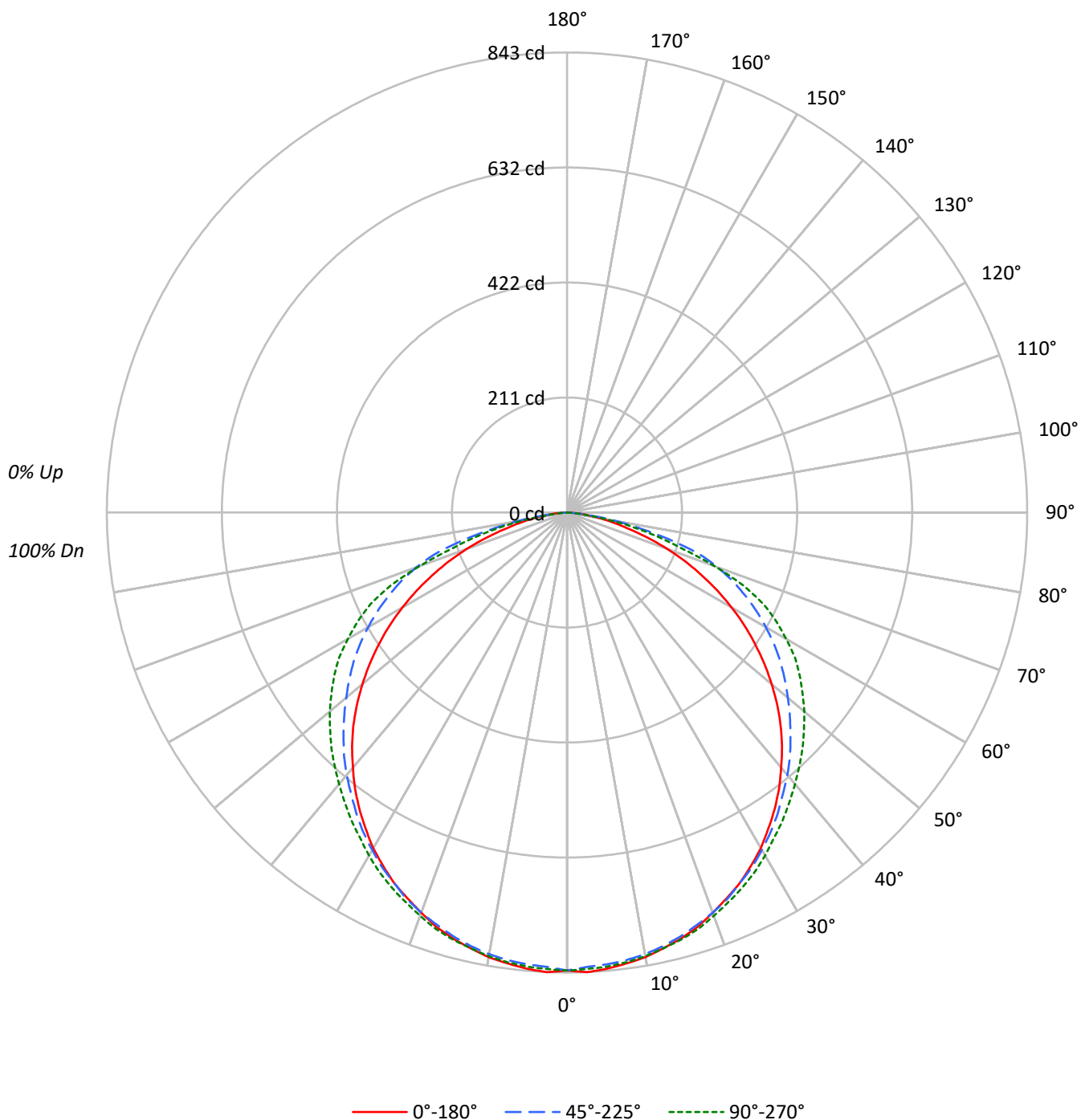
Lumens per Lamp: N/A  
Luminaire Lumens: 2505.7 lumens  
Efficiency: N/A  
Efficacy: 91.8 lumens/watt  
Spacing Criteria (0/90/45): 1.25 / 1.29 / 1.4  
Luminous Opening: Rectangular (W 1' x L: 4' x H: 0')  
CIE Type: Direct

Input Watts (W): 27.3  
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

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CATALOG NUMBER: 14CZ-LD5-39-UNV-L930-RDP-CD1-U

### Luminous Intensity Polar Plot



TEST NUMBER: P982608

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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 | 100 |    |    |
| 1   | 109 | 104 | 100 | 96  | 106 | 102 | 98  | 94  | 97  | 94  | 91  | 93  | 91  | 88  | 90  | 88  | 86  | 84  |    |    |
| 2   | 99  | 90  | 83  | 77  | 96  | 88  | 82  | 76  | 85  | 79  | 75  | 81  | 77  | 73  | 78  | 75  | 71  | 69  |    |    |
| 3   | 90  | 79  | 71  | 64  | 87  | 77  | 70  | 63  | 74  | 68  | 62  | 71  | 66  | 61  | 69  | 64  | 60  | 58  |    |    |
| 4   | 82  | 70  | 61  | 54  | 80  | 68  | 60  | 53  | 66  | 58  | 53  | 63  | 57  | 52  | 61  | 56  | 51  | 49  |    |    |
| 5   | 75  | 62  | 53  | 46  | 73  | 61  | 52  | 46  | 59  | 51  | 45  | 57  | 50  | 45  | 55  | 49  | 44  | 42  |    |    |
| 6   | 69  | 56  | 47  | 40  | 67  | 55  | 46  | 40  | 53  | 45  | 40  | 51  | 44  | 39  | 50  | 44  | 39  | 37  |    |    |
| 7   | 64  | 50  | 42  | 35  | 62  | 50  | 41  | 35  | 48  | 40  | 35  | 47  | 40  | 35  | 45  | 39  | 34  | 32  |    |    |
| 8   | 60  | 46  | 37  | 31  | 58  | 45  | 37  | 31  | 44  | 36  | 31  | 43  | 36  | 31  | 41  | 35  | 31  | 29  |    |    |
| 9   | 56  | 42  | 34  | 28  | 54  | 42  | 34  | 28  | 40  | 33  | 28  | 39  | 33  | 28  | 38  | 32  | 28  | 26  |    |    |
| 10  | 52  | 39  | 31  | 25  | 51  | 38  | 31  | 25  | 37  | 30  | 25  | 36  | 30  | 25  | 35  | 29  | 25  | 23  |    |    |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 2258 | 2258 | 2258 |
| 5°  | 2267 | 2246 | 2256 |
| 10° | 2261 | 2245 | 2256 |
| 15° | 2251 | 2240 | 2256 |
| 20° | 2235 | 2235 | 2252 |
| 25° | 2224 | 2224 | 2254 |
| 30° | 2207 | 2218 | 2255 |
| 35° | 2179 | 2211 | 2262 |
| 40° | 2144 | 2206 | 2282 |
| 45° | 2107 | 2203 | 2323 |
| 50° | 2048 | 2211 | 2375 |
| 55° | 1973 | 2239 | 2441 |
| 60° | 1874 | 2264 | 2496 |
| 65° | 1731 | 2292 | 2529 |
| 70° | 1539 | 2308 | 2262 |
| 75° | 1240 | 2074 | 1810 |
| 80° | 970  | 1454 | 1182 |
| 85° | 664  | 426  | 303  |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 90°

Vertical Angle: 65°

Luminance: 2529 cd/sqm

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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 79.4   | 3.2       |
| 10°-20°   | 227.9  | 9.1       |
| 20°-30°   | 347.0  | 13.8      |
| 30°-40°   | 422.7  | 16.9      |
| 40°-50°   | 448.4  | 17.9      |
| 50°-60°   | 423.2  | 16.9      |
| 60°-70°   | 341.7  | 13.6      |
| 70°-80°   | 185.4  | 7.4       |
| 80°-90°   | 30.0   | 1.2       |
| 90°-100°  | 0.0    | 0.0       |
| 100°-110° | 0.0    | 0.0       |
| 110°-120° | 0.0    | 0.0       |
| 120°-130° | 0.0    | 0.0       |
| 130°-140° | 0.0    | 0.0       |
| 140°-150° | 0.0    | 0.0       |
| 150°-160° | 0.0    | 0.0       |
| 160°-170° | 0.0    | 0.0       |
| 170°-180° | 0.0    | 0.0       |
| 0°-30°    | 654.3  | 26.1      |
| 0°-40°    | 1077.0 | 43.0      |
| 0°-60°    | 1948.6 | 77.8      |
| 0°-90°    | 2505.7 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 2505.7 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°  | 22.5° | 45° | 67.5° | 90° | Flux |
|-----|-----|-------|-----|-------|-----|------|
| 0°  | 839 | 839   | 839 | 839   | 839 |      |
| 5°  | 839 | 837   | 831 | 837   | 835 | 80   |
| 15° | 808 | 806   | 804 | 810   | 810 | 228  |
| 25° | 749 | 747   | 749 | 757   | 759 | 345  |
| 35° | 663 | 667   | 673 | 687   | 689 | 415  |
| 45° | 554 | 562   | 579 | 600   | 610 | 426  |
| 55° | 421 | 438   | 477 | 508   | 520 | 376  |
| 65° | 272 | 305   | 360 | 389   | 397 | 269  |
| 75° | 119 | 174   | 200 | 180   | 174 | 130  |
| 85° | 22  | 24    | 14  | 12    | 10  | 28   |
| 90° | 0   | 0     | 0   | 0     | 0   |      |

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**CANDELA DISTRIBUTION (FULL):**

|       | 0°    | 22.5° | 45°   | 67.5° | 90°   |
|-------|-------|-------|-------|-------|-------|
| 0°    | 839.2 | 839.2 | 839.2 | 839.2 | 839.2 |
| 2.5°  | 843.2 | 839.2 | 833.4 | 839.2 | 837.3 |
| 5°    | 839.2 | 837.3 | 831.3 | 837.3 | 835.3 |
| 7.5°  | 833.4 | 833.4 | 827.5 | 831.3 | 831.3 |
| 10°   | 827.5 | 825.5 | 821.7 | 827.5 | 825.5 |
| 12.5° | 817.7 | 815.7 | 813.8 | 819.6 | 817.7 |
| 15°   | 807.9 | 805.9 | 804.0 | 809.8 | 809.8 |
| 17.5° | 796.3 | 794.2 | 792.3 | 800.0 | 800.0 |
| 20°   | 780.4 | 780.4 | 780.4 | 788.4 | 786.5 |
| 22.5° | 764.8 | 764.8 | 766.9 | 774.6 | 772.7 |
| 25°   | 749.2 | 747.3 | 749.2 | 757.1 | 759.0 |
| 27.5° | 729.8 | 731.6 | 733.5 | 741.4 | 743.3 |
| 30°   | 710.2 | 712.0 | 713.9 | 723.7 | 725.8 |
| 32.5° | 686.6 | 690.6 | 694.5 | 706.2 | 706.2 |
| 35°   | 663.2 | 667.0 | 672.9 | 686.6 | 688.7 |
| 37.5° | 637.8 | 641.6 | 649.5 | 665.1 | 669.1 |
| 40°   | 610.3 | 616.1 | 628.0 | 643.6 | 649.5 |
| 42.5° | 583.0 | 590.7 | 604.5 | 622.2 | 629.9 |
| 45°   | 553.6 | 561.5 | 579.0 | 600.5 | 610.3 |
| 47.5° | 522.3 | 532.1 | 553.6 | 580.9 | 588.8 |
| 50°   | 489.1 | 502.7 | 528.1 | 557.5 | 567.3 |
| 52.5° | 455.8 | 471.4 | 502.7 | 534.0 | 543.8 |
| 55°   | 420.6 | 438.3 | 477.3 | 508.5 | 520.4 |
| 57.5° | 385.3 | 404.9 | 449.9 | 483.1 | 495.0 |
| 60°   | 348.2 | 371.8 | 420.6 | 453.9 | 463.7 |
| 62.5° | 311.1 | 338.4 | 391.2 | 424.5 | 432.2 |
| 65°   | 271.9 | 305.2 | 359.9 | 389.3 | 397.2 |
| 67.5° | 234.8 | 274.0 | 328.6 | 350.1 | 350.1 |
| 70°   | 195.6 | 238.7 | 293.4 | 299.2 | 287.5 |
| 72.5° | 156.6 | 205.4 | 254.4 | 232.7 | 223.1 |
| 75°   | 119.3 | 174.1 | 199.5 | 179.9 | 174.1 |
| 77.5° | 90.1  | 140.9 | 140.9 | 129.1 | 125.1 |
| 80°   | 62.6  | 107.6 | 93.8  | 82.2  | 76.3  |
| 82.5° | 41.1  | 60.7  | 49.0  | 39.2  | 33.2  |
| 85°   | 21.5  | 23.6  | 13.8  | 11.7  | 9.8   |
| 87.5° | 7.9   | 4.0   | 1.9   | 4.0   | 1.9   |
| 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

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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 3000K 4-step quadrangle

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### Photopic Flux vs. Wavelength



### Photopic Lumens: NR

| $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>$\text{W}^{\wedge}/\text{nm}$ | Lumens<br>( $\phi/\text{nm}$ ) |
|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|-------------------|----------------------------------------|--------------------------------|
| 360               | 0                                      | NR                             | 490               | 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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### Scotopic Flux vs. Wavelength



Scotopic Lumens: NR

S/P: 1.43

| λ<br>(nm) | Power<br>W <sup>λ</sup> /nm | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>W <sup>λ</sup> /nm | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>W <sup>λ</sup> /nm | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>W <sup>λ</sup> /nm | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>W <sup>λ</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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### Melanopic Flux vs. Wavelength



Melanopic Lumens: NR

M/P: 2.8

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