

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: P982629

Luminaire Tested: 22CZ-LD5-20SE-UNV-L830-CD1-U

Issue Date: 04/23/2025

**Test Information**

Test Method: LM-79-2019  
Report Number: P982629  
Test Lab: INNOVATION CENTER(P3)  
Issue Date: 04/23/2025  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: METALUX  
Catalog Number: 22CZ-LD5-20SE-UNV-L830-CD1-U  
Description: METALUX CRUZE 2x2 2000LM STANDARD EFFICACY PACKAGE 80CRI 3000K TROFFER STANDARD  
Light Source: 3000K CCT, 80 CRI LEDS  
Ballast/Driver: -

**Summary**

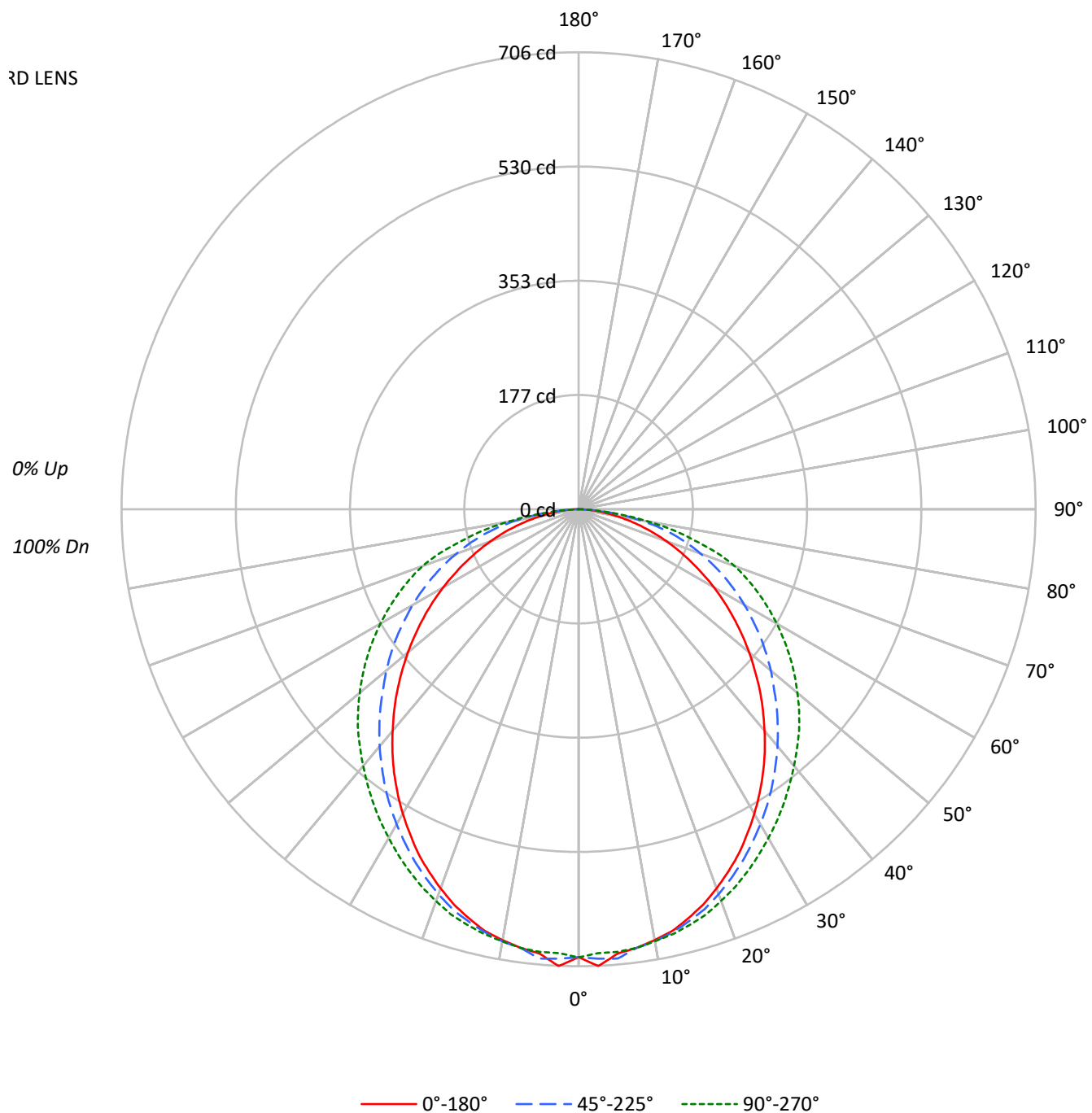
Lumens per Lamp: N/A  
Luminaire Lumens: 1939.0 lumens  
Efficiency: N/A  
Efficacy: 119.7 lumens/watt  
Spacing Criteria (0/90/45): 1.17 / 1.26 / 1.34  
Luminous Opening: Rectangular (W 2' x L: 2' x H: 0')  
CIE Type: Direct

Input Watts (W): 16.2  
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: 22CZ-LD5-20SE-UNV-L830-CD1-U

### Luminous Intensity Polar Plot



TEST NUMBER: P982629

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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   | 108 | 104 | 99  | 95  | 106 | 101 | 97  | 94  | 97  | 94  | 91  | 93  | 90  | 88  | 89  | 87  | 85  | 83  |    |    |
| 2   | 98  | 90  | 83  | 77  | 96  | 88  | 82  | 76  | 84  | 79  | 74  | 81  | 77  | 73  | 78  | 74  | 71  | 69  |    |    |
| 3   | 90  | 79  | 70  | 64  | 87  | 77  | 69  | 63  | 74  | 68  | 62  | 71  | 66  | 61  | 69  | 64  | 60  | 58  |    |    |
| 4   | 82  | 70  | 61  | 54  | 80  | 68  | 60  | 54  | 66  | 59  | 53  | 64  | 57  | 52  | 61  | 56  | 51  | 49  |    |    |
| 5   | 75  | 62  | 53  | 46  | 73  | 61  | 53  | 46  | 59  | 51  | 46  | 57  | 50  | 45  | 55  | 49  | 45  | 43  |    |    |
| 6   | 70  | 56  | 47  | 41  | 68  | 55  | 47  | 40  | 53  | 46  | 40  | 52  | 45  | 40  | 50  | 44  | 39  | 37  |    |    |
| 7   | 65  | 51  | 42  | 36  | 63  | 50  | 42  | 36  | 48  | 41  | 35  | 47  | 40  | 35  | 46  | 40  | 35  | 33  |    |    |
| 8   | 60  | 46  | 38  | 32  | 58  | 46  | 38  | 32  | 44  | 37  | 32  | 43  | 36  | 31  | 42  | 36  | 31  | 29  |    |    |
| 9   | 56  | 43  | 34  | 29  | 55  | 42  | 34  | 29  | 41  | 34  | 29  | 40  | 33  | 28  | 39  | 33  | 28  | 26  |    |    |
| 10  | 53  | 39  | 31  | 26  | 51  | 39  | 31  | 26  | 38  | 31  | 26  | 37  | 30  | 26  | 36  | 30  | 26  | 24  |    |    |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 1862 | 1862 | 1862 |
| 5°  | 1862 | 1882 | 1854 |
| 10° | 1847 | 1852 | 1852 |
| 15° | 1823 | 1836 | 1852 |
| 20° | 1785 | 1812 | 1844 |
| 25° | 1741 | 1781 | 1834 |
| 30° | 1688 | 1746 | 1822 |
| 35° | 1632 | 1713 | 1818 |
| 40° | 1570 | 1679 | 1819 |
| 45° | 1507 | 1647 | 1834 |
| 50° | 1441 | 1622 | 1847 |
| 55° | 1371 | 1606 | 1871 |
| 60° | 1299 | 1594 | 1903 |
| 65° | 1219 | 1585 | 1952 |
| 70° | 1135 | 1581 | 2018 |
| 75° | 1029 | 1578 | 1912 |
| 80° | 891  | 1461 | 1695 |
| 85° | 756  | 1105 | 1078 |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 90°

Vertical Angle: 70°

Luminance: 2018 cd/sqm

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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 65.6   | 3.4       |
| 10°-20°   | 185.9  | 9.6       |
| 20°-30°   | 276.6  | 14.3      |
| 30°-40°   | 327.1  | 16.9      |
| 40°-50°   | 336.2  | 17.3      |
| 50°-60°   | 307.3  | 15.8      |
| 60°-70°   | 245.8  | 12.7      |
| 70°-80°   | 154.3  | 8.0       |
| 80°-90°   | 40.2   | 2.1       |
| 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°    | 528.2  | 27.2      |
| 0°-40°    | 855.3  | 44.1      |
| 0°-60°    | 1498.8 | 77.3      |
| 0°-90°    | 1939.0 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 1939.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°  | 22.5° | 45° | 67.5° | 90° | Flux |
|-----|-----|-------|-----|-------|-----|------|
| 0°  | 692 | 692   | 692 | 692   | 692 |      |
| 5°  | 689 | 689   | 697 | 692   | 686 | 66   |
| 15° | 654 | 655   | 659 | 663   | 665 | 184  |
| 25° | 586 | 590   | 600 | 610   | 618 | 270  |
| 35° | 497 | 504   | 522 | 541   | 553 | 311  |
| 45° | 396 | 406   | 433 | 465   | 482 | 305  |
| 55° | 292 | 306   | 342 | 380   | 399 | 261  |
| 65° | 191 | 208   | 249 | 287   | 306 | 190  |
| 75° | 99  | 118   | 152 | 174   | 184 | 105  |
| 85° | 24  | 31    | 36  | 35    | 35  | 28   |
| 90° | 0   | 0     | 0   | 0     | 0   |      |

TEST NUMBER: P982629

CATALOG NUMBER: 22CZ-LD5-20SE-UNV-L830-CD1-U

**CANDELA DISTRIBUTION (FULL):**

|       | 0°    | 22.5° | 45°   | 67.5° | 90°   |
|-------|-------|-------|-------|-------|-------|
| 0°    | 692.1 | 692.1 | 692.1 | 692.1 | 692.1 |
| 2.5°  | 706.3 | 703.4 | 694.9 | 689.2 | 686.5 |
| 5°    | 689.2 | 689.2 | 696.8 | 692.1 | 686.5 |
| 7.5°  | 683.6 | 683.6 | 683.6 | 697.8 | 683.6 |
| 10°   | 676.0 | 677.0 | 677.9 | 683.6 | 677.9 |
| 12.5° | 667.6 | 667.6 | 669.4 | 671.3 | 672.3 |
| 15°   | 654.4 | 655.3 | 659.1 | 662.8 | 664.7 |
| 17.5° | 640.3 | 643.0 | 647.8 | 652.5 | 656.2 |
| 20°   | 623.2 | 627.1 | 632.7 | 640.3 | 644.0 |
| 22.5° | 605.3 | 609.1 | 616.7 | 625.1 | 631.7 |
| 25°   | 586.5 | 590.3 | 599.7 | 610.1 | 617.6 |
| 27.5° | 564.8 | 569.5 | 580.9 | 595.0 | 602.5 |
| 30°   | 543.1 | 548.8 | 562.0 | 578.0 | 586.5 |
| 32.5° | 520.4 | 527.0 | 542.2 | 560.0 | 570.5 |
| 35°   | 496.9 | 503.5 | 521.5 | 541.3 | 553.4 |
| 37.5° | 472.4 | 479.9 | 499.7 | 522.4 | 535.6 |
| 40°   | 446.9 | 455.5 | 478.1 | 502.6 | 517.7 |
| 42.5° | 421.4 | 430.9 | 455.5 | 484.7 | 499.7 |
| 45°   | 396.0 | 406.4 | 432.8 | 464.9 | 481.9 |
| 47.5° | 369.6 | 381.9 | 409.2 | 445.1 | 462.1 |
| 50°   | 344.2 | 356.4 | 387.5 | 424.3 | 441.2 |
| 52.5° | 317.8 | 331.9 | 364.9 | 402.6 | 420.5 |
| 55°   | 292.3 | 306.5 | 342.3 | 380.0 | 398.9 |
| 57.5° | 266.9 | 281.0 | 318.7 | 357.4 | 376.2 |
| 60°   | 241.4 | 256.5 | 296.1 | 333.8 | 353.6 |
| 62.5° | 215.9 | 231.9 | 272.5 | 311.1 | 330.0 |
| 65°   | 191.4 | 208.4 | 248.9 | 286.7 | 306.5 |
| 67.5° | 167.9 | 185.7 | 225.3 | 262.1 | 281.9 |
| 70°   | 144.3 | 162.2 | 200.9 | 236.7 | 256.5 |
| 72.5° | 121.7 | 139.5 | 177.3 | 209.3 | 224.4 |
| 75°   | 99.0  | 117.9 | 151.8 | 174.5 | 183.9 |
| 77.5° | 77.3  | 96.2  | 125.4 | 140.5 | 150.9 |
| 80°   | 57.5  | 73.5  | 94.3  | 105.6 | 109.4 |
| 82.5° | 39.6  | 52.8  | 66.0  | 68.9  | 70.7  |
| 85°   | 24.5  | 31.1  | 35.8  | 34.9  | 34.9  |
| 87.5° | 11.3  | 12.3  | 10.4  | 7.5   | 4.7   |
| 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

| λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) |
|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|
| 360       | 0                           | NR               | 490       | 101                         | NR               | 620       | 329                         | NR               | 750       | 8                           | NR               | 880       | 0                           | NR               |
| 365       | 0                           | NR               | 495       | 121                         | NR               | 625       | 331                         | NR               | 755       | 7                           | NR               | 885       | 0                           | NR               |
| 370       | 0                           | NR               | 500       | 143                         | NR               | 630       | 1000                        | NR               | 760       | 6                           | NR               | 890       | 0                           | NR               |
| 375       | 0                           | NR               | 505       | 161                         | NR               | 635       | 709                         | NR               | 765       | 5                           | NR               | 895       | 0                           | NR               |
| 380       | 0                           | NR               | 510       | 176                         | NR               | 640       | 220                         | NR               | 770       | 4                           | NR               | 900       | 0                           | NR               |
| 385       | 0                           | NR               | 515       | 189                         | NR               | 645       | 210                         | NR               | 775       | 3                           | NR               | 905       | 0                           | NR               |
| 390       | 0                           | NR               | 520       | 196                         | NR               | 650       | 188                         | NR               | 780       | 3                           | NR               | 910       | 0                           | NR               |
| 395       | 1                           | NR               | 525       | 203                         | NR               | 655       | 156                         | NR               | 785       | 2                           | NR               | 915       | 0                           | NR               |
| 400       | 1                           | NR               | 530       | 208                         | NR               | 660       | 134                         | NR               | 790       | 2                           | NR               | 920       | 0                           | NR               |
| 405       | 2                           | NR               | 535       | 213                         | NR               | 665       | 112                         | NR               | 795       | 2                           | NR               | 925       | 0                           | NR               |
| 410       | 3                           | NR               | 540       | 219                         | NR               | 670       | 104                         | NR               | 800       | 1                           | NR               | 930       | 0                           | NR               |
| 415       | 6                           | NR               | 545       | 226                         | NR               | 675       | 85                          | NR               | 805       | 1                           | NR               | 935       | 0                           | NR               |
| 420       | 10                          | NR               | 550       | 233                         | NR               | 680       | 72                          | NR               | 810       | 1                           | NR               | 940       | 0                           | NR               |
| 425       | 17                          | NR               | 555       | 241                         | NR               | 685       | 63                          | NR               | 815       | 1                           | NR               | 945       | 0                           | NR               |
| 430       | 30                          | NR               | 560       | 250                         | NR               | 690       | 53                          | NR               | 820       | 1                           | NR               | 950       | 0                           | NR               |
| 435       | 53                          | NR               | 565       | 260                         | NR               | 695       | 46                          | NR               | 825       | 1                           | NR               | 955       | 0                           | NR               |
| 440       | 92                          | NR               | 570       | 270                         | NR               | 700       | 39                          | NR               | 830       | 1                           | NR               | 960       | 0                           | NR               |
| 445       | 160                         | NR               | 575       | 280                         | NR               | 705       | 33                          | NR               | 835       | 1                           | NR               | 965       | 0                           | NR               |
| 450       | 214                         | NR               | 580       | 289                         | NR               | 710       | 28                          | NR               | 840       | 0                           | NR               | 970       | 0                           | NR               |
| 455       | 183                         | NR               | 585       | 298                         | NR               | 715       | 24                          | NR               | 845       | 0                           | NR               | 975       | 0                           | NR               |
| 460       | 133                         | NR               | 590       | 305                         | NR               | 720       | 20                          | NR               | 850       | 0                           | NR               | 980       | 0                           | NR               |
| 465       | 111                         | NR               | 595       | 309                         | NR               | 725       | 17                          | NR               | 855       | 0                           | NR               | 985       | 0                           | NR               |
| 470       | 91                          | NR               | 600       | 314                         | NR               | 730       | 15                          | NR               | 860       | 0                           | NR               | 990       | 0                           | NR               |
| 475       | 77                          | NR               | 605       | 318                         | NR               | 735       | 13                          | NR               | 865       | 0                           | NR               | 995       | 0                           | NR               |
| 480       | 76                          | NR               | 610       | 356                         | NR               | 740       | 11                          | NR               | 870       | 0                           | NR               | 1000      | 0                           | NR               |
| 485       | 86                          | NR               | 615       | 390                         | NR               | 745       | 9                           | NR               | 875       | 0                           | NR               |           |                             |                  |

REPORT NUMBER: SP3-2508-516-5

### Scotopic Flux vs. Wavelength



Scotopic Lumens: NR

S/P: 1.43

| λ (nm) | Power W <sup>^</sup> /nm | Lumens (Φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (Φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (Φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (Φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (Φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 101                      | NR            | 620    | 329                      | NR            | 750    | 8                        | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 121                      | NR            | 625    | 331                      | NR            | 755    | 7                        | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 143                      | NR            | 630    | 1000                     | NR            | 760    | 6                        | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 161                      | NR            | 635    | 709                      | NR            | 765    | 5                        | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 176                      | NR            | 640    | 220                      | NR            | 770    | 4                        | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 189                      | NR            | 645    | 210                      | NR            | 775    | 3                        | NR            | 905    | 0                        | NR            |
| 390    | 0                        | NR            | 520    | 196                      | NR            | 650    | 188                      | NR            | 780    | 3                        | NR            | 910    | 0                        | NR            |
| 395    | 1                        | NR            | 525    | 203                      | NR            | 655    | 156                      | NR            | 785    | 2                        | NR            | 915    | 0                        | NR            |
| 400    | 1                        | NR            | 530    | 208                      | NR            | 660    | 134                      | NR            | 790    | 2                        | NR            | 920    | 0                        | NR            |
| 405    | 2                        | NR            | 535    | 213                      | NR            | 665    | 112                      | NR            | 795    | 2                        | NR            | 925    | 0                        | NR            |
| 410    | 3                        | NR            | 540    | 219                      | NR            | 670    | 104                      | NR            | 800    | 1                        | NR            | 930    | 0                        | NR            |
| 415    | 6                        | NR            | 545    | 226                      | NR            | 675    | 85                       | NR            | 805    | 1                        | NR            | 935    | 0                        | NR            |
| 420    | 10                       | NR            | 550    | 233                      | NR            | 680    | 72                       | NR            | 810    | 1                        | NR            | 940    | 0                        | NR            |
| 425    | 17                       | NR            | 555    | 241                      | NR            | 685    | 63                       | NR            | 815    | 1                        | NR            | 945    | 0                        | NR            |
| 430    | 30                       | NR            | 560    | 250                      | NR            | 690    | 53                       | NR            | 820    | 1                        | NR            | 950    | 0                        | NR            |
| 435    | 53                       | NR            | 565    | 260                      | NR            | 695    | 46                       | NR            | 825    | 1                        | NR            | 955    | 0                        | NR            |
| 440    | 92                       | NR            | 570    | 270                      | NR            | 700    | 39                       | NR            | 830    | 1                        | NR            | 960    | 0                        | NR            |
| 445    | 160                      | NR            | 575    | 280                      | NR            | 705    | 33                       | NR            | 835    | 1                        | NR            | 965    | 0                        | NR            |
| 450    | 214                      | NR            | 580    | 289                      | NR            | 710    | 28                       | NR            | 840    | 0                        | NR            | 970    | 0                        | NR            |
| 455    | 183                      | NR            | 585    | 298                      | NR            | 715    | 24                       | NR            | 845    | 0                        | NR            | 975    | 0                        | NR            |
| 460    | 133                      | NR            | 590    | 305                      | NR            | 720    | 20                       | NR            | 850    | 0                        | NR            | 980    | 0                        | NR            |
| 465    | 111                      | NR            | 595    | 309                      | NR            | 725    | 17                       | NR            | 855    | 0                        | NR            | 985    | 0                        | NR            |
| 470    | 91                       | NR            | 600    | 314                      | NR            | 730    | 15                       | NR            | 860    | 0                        | NR            | 990    | 0                        | NR            |
| 475    | 77                       | NR            | 605    | 318                      | NR            | 735    | 13                       | NR            | 865    | 0                        | NR            | 995    | 0                        | NR            |
| 480    | 76                       | NR            | 610    | 356                      | NR            | 740    | 11                       | NR            | 870    | 0                        | NR            | 1000   | 0                        | NR            |
| 485    | 86                       | NR            | 615    | 390                      | NR            | 745    | 9                        | NR            | 875    | 0                        | NR            |        |                          |               |

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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)