

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: P983015

Luminaire Tested: 24CZ-LD5-40SE-UNV-L935-HRP-CD1-U

Issue Date: 04/23/2025

**Test Information**

Test Method: LM-79-2019  
Report Number: P983015  
Test Lab: INNOVATION CENTER(P3)  
Issue Date: 04/23/2025  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: METALUX  
Catalog Number: 24CZ-LD5-40SE-UNV-L935-HRP-CD1-U  
Description: METALUX CRUZE 2x4 4000LM STANDARD EFFICACY PACKAGE 90CRI 3500K TROFFER LENS WITH FILM INSERT  
Light Source: 3500K CCT, 90 CRI LEDS  
Ballast/Driver: -

**Summary**

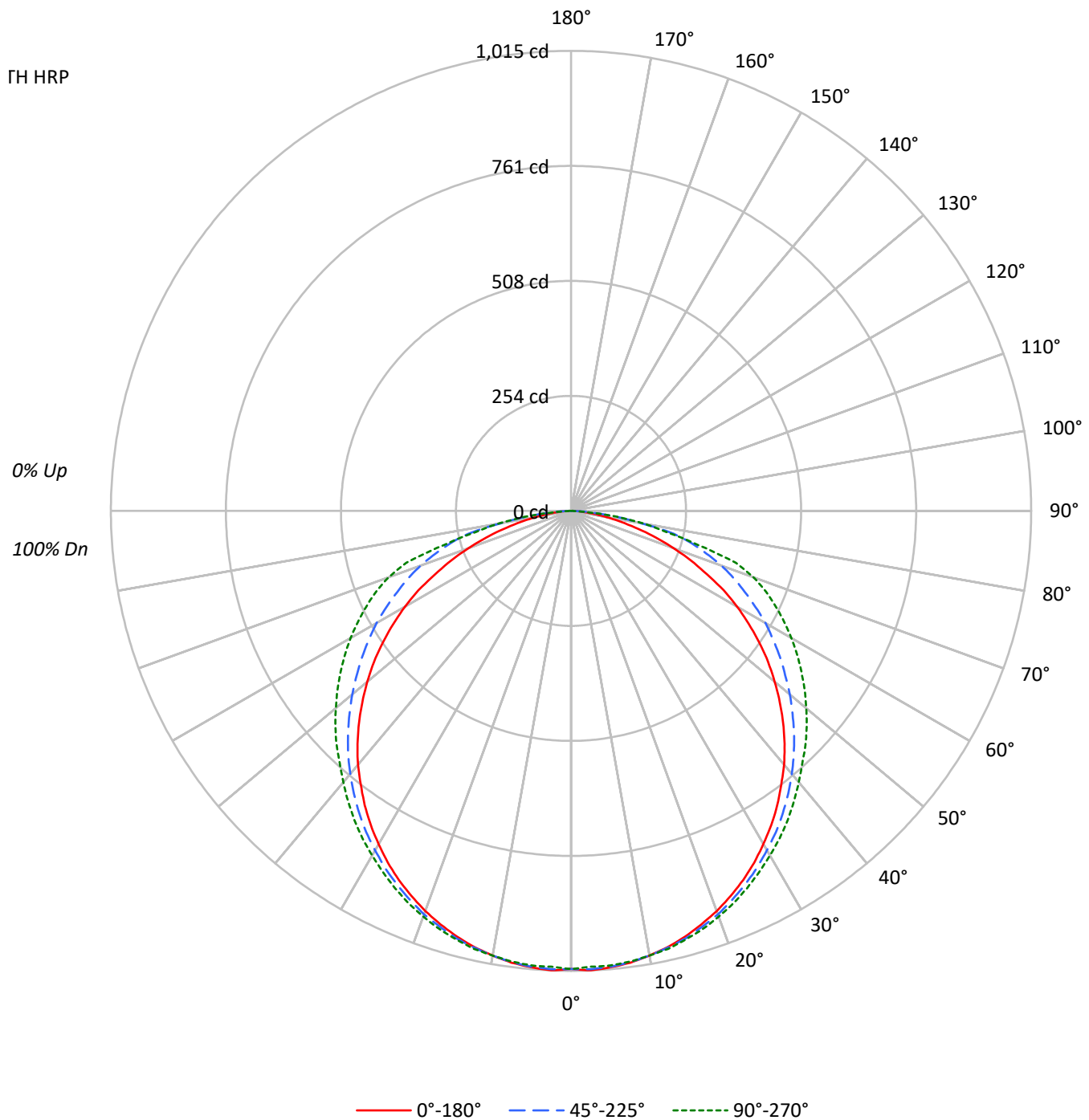
Lumens per Lamp: N/A  
Luminaire Lumens: 3076.0 lumens  
Efficiency: N/A  
Efficacy: 101.2 lumens/watt  
Spacing Criteria (0/90/45): 1.25 / 1.29 / 1.4  
Luminous Opening: Rectangular (W 2' x L: 4' x H: 0')  
CIE Type: Direct

Input Watts (W): 30.4  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT

TEST NUMBER: P983015

CATALOG NUMBER: 24CZ-LD5-40SE-UNV-L935-HRP-CD1-U

### Luminous Intensity Polar Plot



TEST NUMBER: P983015

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

|     |     |     |     |     |     |     |     |     |     |     |     |  |     |     |     |  |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|-----|-----|-----|--|-----|
| RF  | 20  |     |     |     | 20  |     |     |     | 20  |     |     |  | 20  |     |     |  | 20  |
| RC  | 80  |     |     |     | 70  |     |     |     | 50  |     |     |  | 30  |     |     |  | 10  |
| RW  | 70  | 50  | 30  | 10  | 70  | 50  | 30  | 10  | 50  | 30  | 10  |  | 50  | 30  | 10  |  | 50  |
| RCR |     |     |     |     |     |     |     |     |     |     |     |  |     |     |     |  |     |
| 0   | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 |  | 106 | 106 | 106 |  | 102 |
| 1   | 108 | 103 | 99  | 95  | 105 | 101 | 97  | 93  | 97  | 93  | 90  |  | 93  | 90  | 87  |  | 89  |
| 2   | 98  | 89  | 82  | 76  | 95  | 87  | 81  | 75  | 84  | 78  | 74  |  | 81  | 76  | 72  |  | 77  |
| 3   | 89  | 78  | 70  | 63  | 86  | 76  | 69  | 62  | 73  | 67  | 61  |  | 71  | 65  | 60  |  | 68  |
| 4   | 81  | 69  | 60  | 53  | 79  | 68  | 59  | 52  | 65  | 58  | 52  |  | 63  | 56  | 51  |  | 60  |
| 5   | 75  | 61  | 52  | 45  | 72  | 60  | 52  | 45  | 58  | 50  | 44  |  | 56  | 49  | 44  |  | 54  |
| 6   | 69  | 55  | 46  | 39  | 67  | 54  | 45  | 39  | 52  | 45  | 39  |  | 51  | 44  | 38  |  | 49  |
| 7   | 64  | 50  | 41  | 35  | 62  | 49  | 41  | 34  | 48  | 40  | 34  |  | 46  | 39  | 34  |  | 45  |
| 8   | 59  | 45  | 37  | 31  | 58  | 45  | 36  | 31  | 43  | 36  | 31  |  | 42  | 35  | 30  |  | 41  |
| 9   | 55  | 42  | 33  | 28  | 54  | 41  | 33  | 28  | 40  | 33  | 27  |  | 39  | 32  | 27  |  | 38  |
| 10  | 52  | 38  | 30  | 25  | 51  | 38  | 30  | 25  | 37  | 30  | 25  |  | 36  | 29  | 25  |  | 35  |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 1360 | 1360 | 1360 |
| 5°  | 1365 | 1363 | 1360 |
| 10° | 1361 | 1361 | 1361 |
| 15° | 1355 | 1360 | 1364 |
| 20° | 1345 | 1357 | 1364 |
| 25° | 1334 | 1350 | 1363 |
| 30° | 1318 | 1343 | 1363 |
| 35° | 1303 | 1338 | 1368 |
| 40° | 1284 | 1331 | 1372 |
| 45° | 1259 | 1324 | 1392 |
| 50° | 1227 | 1318 | 1418 |
| 55° | 1190 | 1320 | 1456 |
| 60° | 1138 | 1333 | 1510 |
| 65° | 1053 | 1347 | 1586 |
| 70° | 948  | 1389 | 1685 |
| 75° | 802  | 1432 | 1507 |
| 80° | 623  | 1225 | 1266 |
| 85° | 448  | 834  | 732  |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 90°

Vertical Angle: 72.5°

Luminance: 1704 cd/sqm

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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 95.8   | 3.1       |
| 10°-20°   | 275.1  | 8.9       |
| 20°-30°   | 418.3  | 13.6      |
| 30°-40°   | 508.2  | 16.5      |
| 40°-50°   | 536.4  | 17.4      |
| 50°-60°   | 504.0  | 16.4      |
| 60°-70°   | 414.9  | 13.5      |
| 70°-80°   | 261.4  | 8.5       |
| 80°-90°   | 61.7   | 2.0       |
| 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°    | 789.2  | 25.7      |
| 0°-40°    | 1297.4 | 42.2      |
| 0°-60°    | 2337.9 | 76.0      |
| 0°-90°    | 3076.0 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 3076.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°   | 22.5° | 45°  | 67.5° | 90°  | Flux |
|-----|------|-------|------|-------|------|------|
| 0°  | 1011 | 1011  | 1011 | 1011  | 1011 |      |
| 5°  | 1011 | 1005  | 1009 | 1008  | 1007 | 96   |
| 15° | 972  | 968   | 976  | 979   | 979  | 274  |
| 25° | 899  | 897   | 909  | 914   | 918  | 414  |
| 35° | 793  | 797   | 814  | 825   | 833  | 496  |
| 45° | 662  | 672   | 696  | 716   | 731  | 510  |
| 55° | 507  | 526   | 563  | 602   | 621  | 453  |
| 65° | 331  | 362   | 423  | 477   | 498  | 328  |
| 75° | 154  | 202   | 275  | 300   | 290  | 165  |
| 85° | 29   | 49    | 54   | 50    | 47   | 36   |
| 90° | 0    | 0     | 0    | 0     | 0    |      |

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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 22.5°  | 45°    | 67.5°  | 90°    |
|-------|--------|--------|--------|--------|--------|
| 0°    | 1010.7 | 1010.7 | 1010.7 | 1010.7 | 1010.7 |
| 2.5°  | 1014.6 | 1008.0 | 1012.0 | 1010.7 | 1006.7 |
| 5°    | 1010.7 | 1005.4 | 1009.3 | 1008.0 | 1006.7 |
| 7.5°  | 1005.4 | 1000.1 | 1004.1 | 1002.7 | 1002.7 |
| 10°   | 996.2  | 992.2  | 996.2  | 996.2  | 996.2  |
| 12.5° | 985.6  | 981.7  | 986.9  | 988.2  | 989.6  |
| 15°   | 972.4  | 968.5  | 976.4  | 979.0  | 979.0  |
| 17.5° | 956.6  | 954.0  | 961.9  | 964.5  | 967.2  |
| 20°   | 939.5  | 938.2  | 947.4  | 950.0  | 952.7  |
| 22.5° | 919.7  | 919.7  | 929.0  | 931.6  | 936.9  |
| 25°   | 898.6  | 897.3  | 909.2  | 914.5  | 918.4  |
| 27.5° | 874.9  | 874.9  | 888.1  | 894.7  | 898.6  |
| 30°   | 848.6  | 851.2  | 864.4  | 872.3  | 877.6  |
| 32.5° | 822.2  | 824.9  | 840.7  | 849.9  | 856.5  |
| 35°   | 793.2  | 797.2  | 814.3  | 824.9  | 832.8  |
| 37.5° | 761.6  | 768.2  | 786.6  | 798.5  | 807.7  |
| 40°   | 731.3  | 736.6  | 757.7  | 770.8  | 781.4  |
| 42.5° | 697.0  | 706.3  | 727.4  | 743.2  | 755.0  |
| 45°   | 661.5  | 672.0  | 695.7  | 715.5  | 731.3  |
| 47.5° | 624.6  | 637.8  | 662.8  | 689.1  | 705.0  |
| 50°   | 586.4  | 600.9  | 629.8  | 661.5  | 677.3  |
| 52.5° | 548.1  | 564.0  | 595.6  | 632.5  | 649.6  |
| 55°   | 507.3  | 525.7  | 562.6  | 602.2  | 620.6  |
| 57.5° | 465.1  | 486.2  | 528.4  | 573.2  | 591.6  |
| 60°   | 423.0  | 445.4  | 495.4  | 540.2  | 561.3  |
| 62.5° | 379.5  | 404.5  | 458.5  | 509.9  | 529.7  |
| 65°   | 330.7  | 362.4  | 423.0  | 477.0  | 498.1  |
| 67.5° | 285.9  | 318.9  | 388.7  | 442.7  | 465.1  |
| 70°   | 241.1  | 279.3  | 353.1  | 407.2  | 428.2  |
| 72.5° | 196.3  | 241.1  | 313.6  | 368.9  | 380.8  |
| 75°   | 154.2  | 201.6  | 275.4  | 300.4  | 289.9  |
| 77.5° | 113.3  | 166.0  | 231.9  | 218.7  | 216.1  |
| 80°   | 80.4   | 131.8  | 158.1  | 159.4  | 163.4  |
| 82.5° | 51.4   | 97.5   | 102.8  | 104.1  | 105.4  |
| 85°   | 29.0   | 48.8   | 54.0   | 50.1   | 47.4   |
| 87.5° | 13.2   | 15.8   | 13.2   | 9.2    | 7.9    |
| 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: SP3-2508-516-6

Test Date: 09/03/2025

Luminaire Tested: 24CZ-LD5-65-S-UNV-L935-CD1-U

Data in this report applies to families of products including 24CZ-LD5-65-S-UNV-L935-CD1-U

### Test Information

Test Method: LM-79-2019  
 Report Number: SP3-2508-516-6  
 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-L935-CD1-U**  
 Description: 2X4 CRUZE SB 6500LM 935 SMOOTH LENS

### Spectral Parameters

CCT (K): 3412  
 CIE  $u'$ : 0.2386  
 CIE  $v'$ : 0.5111  
 Duv: -0.0015  
 CIE x: 0.4087  
 CIE y: 0.3890  
 CIE z: 0.2023  
 Peak Wavelength (nm): 630  
 Dominant Wavelength (nm): 581  
 Purity: 39.41044  
 R<sub>f</sub>: 92.6  
 R<sub>g</sub>: 102

CRI (Ra): 96.3  
 R1: 99.2  
 R2: 97.9  
 R3: 94.7  
 R4: 96.6  
 R5: 98.4  
 R6: 96.1  
 R7: 95.6  
 R8: 92.0  
 R9: 78.4  
 R10: 93.0  
 R11: 94.5  
 R12: 81.5  
 R13: 99.0  
 R14: 95.8  
 R15: 96.7



### Test Conditions

Stabilization Time: 20M  
 Operation Time: 1H 20M  
 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 3500K 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               | 112                                    | NR                             | 620               | 281                                    | NR                             | 750               | 6                                      | NR                             | 880               | 0                                      | NR                             |
| 365               | 0                                      | NR                             | 495               | 134                                    | NR                             | 625               | 286                                    | NR                             | 755               | 5                                      | NR                             | 885               | 0                                      | NR                             |
| 370               | 0                                      | NR                             | 500               | 157                                    | NR                             | 630               | 1000                                   | NR                             | 760               | 4                                      | NR                             | 890               | 0                                      | NR                             |
| 375               | 0                                      | NR                             | 505               | 178                                    | NR                             | 635               | 695                                    | NR                             | 765               | 4                                      | NR                             | 895               | 0                                      | NR                             |
| 380               | 0                                      | NR                             | 510               | 193                                    | NR                             | 640               | 181                                    | NR                             | 770               | 3                                      | NR                             | 900               | 0                                      | NR                             |
| 385               | 0                                      | NR                             | 515               | 206                                    | NR                             | 645               | 175                                    | NR                             | 775               | 3                                      | NR                             | 905               | 0                                      | NR                             |
| 390               | 0                                      | NR                             | 520               | 213                                    | NR                             | 650               | 156                                    | NR                             | 780               | 2                                      | NR                             | 910               | 0                                      | NR                             |
| 395               | 1                                      | NR                             | 525               | 219                                    | NR                             | 655               | 127                                    | NR                             | 785               | 2                                      | NR                             | 915               | 0                                      | NR                             |
| 400               | 2                                      | NR                             | 530               | 223                                    | NR                             | 660               | 108                                    | NR                             | 790               | 2                                      | NR                             | 920               | 0                                      | NR                             |
| 405               | 2                                      | NR                             | 535               | 226                                    | NR                             | 665               | 89                                     | NR                             | 795               | 2                                      | NR                             | 925               | 0                                      | NR                             |
| 410               | 4                                      | NR                             | 540               | 230                                    | NR                             | 670               | 84                                     | NR                             | 800               | 1                                      | NR                             | 930               | 0                                      | NR                             |
| 415               | 6                                      | NR                             | 545               | 235                                    | NR                             | 675               | 67                                     | NR                             | 805               | 1                                      | NR                             | 935               | 0                                      | NR                             |
| 420               | 11                                     | NR                             | 550               | 239                                    | NR                             | 680               | 57                                     | NR                             | 810               | 1                                      | NR                             | 940               | 0                                      | NR                             |
| 425               | 19                                     | NR                             | 555               | 243                                    | NR                             | 685               | 50                                     | NR                             | 815               | 1                                      | NR                             | 945               | 0                                      | NR                             |
| 430               | 34                                     | NR                             | 560               | 248                                    | NR                             | 690               | 42                                     | NR                             | 820               | 1                                      | NR                             | 950               | 0                                      | NR                             |
| 435               | 60                                     | NR                             | 565               | 253                                    | NR                             | 695               | 36                                     | NR                             | 825               | 1                                      | NR                             | 955               | 0                                      | NR                             |
| 440               | 106                                    | NR                             | 570               | 256                                    | NR                             | 700               | 31                                     | NR                             | 830               | 0                                      | NR                             | 960               | 0                                      | NR                             |
| 445               | 193                                    | NR                             | 575               | 260                                    | NR                             | 705               | 26                                     | NR                             | 835               | 0                                      | NR                             | 965               | 0                                      | NR                             |
| 450               | 283                                    | NR                             | 580               | 263                                    | NR                             | 710               | 22                                     | NR                             | 840               | 0                                      | NR                             | 970               | 0                                      | NR                             |
| 455               | 234                                    | NR                             | 585               | 266                                    | NR                             | 715               | 19                                     | NR                             | 845               | 0                                      | NR                             | 975               | 0                                      | NR                             |
| 460               | 157                                    | NR                             | 590               | 267                                    | NR                             | 720               | 16                                     | NR                             | 850               | 0                                      | NR                             | 980               | 0                                      | NR                             |
| 465               | 134                                    | NR                             | 595               | 266                                    | NR                             | 725               | 14                                     | NR                             | 855               | 0                                      | NR                             | 985               | 0                                      | NR                             |
| 470               | 107                                    | NR                             | 600               | 268                                    | NR                             | 730               | 12                                     | NR                             | 860               | 0                                      | NR                             | 990               | 0                                      | NR                             |
| 475               | 85                                     | NR                             | 605               | 269                                    | NR                             | 735               | 10                                     | NR                             | 865               | 0                                      | NR                             | 995               | 0                                      | NR                             |
| 480               | 85                                     | NR                             | 610               | 309                                    | NR                             | 740               | 8                                      | NR                             | 870               | 0                                      | NR                             | 1000              | 0                                      | NR                             |
| 485               | 96                                     | NR                             | 615               | 345                                    | NR                             | 745               | 7                                      | NR                             | 875               | 0                                      | NR                             |                   |                                        |                                |

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### Scotopic Flux vs. Wavelength



Scotopic Lumens: NR

S/P: 1.61

| 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       | 112                         | NR               | 620       | 281                         | NR               | 750       | 6                           | NR               | 880       | 0                           | NR               |
| 365       | 0                           | NR               | 495       | 134                         | NR               | 625       | 286                         | NR               | 755       | 5                           | NR               | 885       | 0                           | NR               |
| 370       | 0                           | NR               | 500       | 157                         | NR               | 630       | 1000                        | NR               | 760       | 4                           | NR               | 890       | 0                           | NR               |
| 375       | 0                           | NR               | 505       | 178                         | NR               | 635       | 695                         | NR               | 765       | 4                           | NR               | 895       | 0                           | NR               |
| 380       | 0                           | NR               | 510       | 193                         | NR               | 640       | 181                         | NR               | 770       | 3                           | NR               | 900       | 0                           | NR               |
| 385       | 0                           | NR               | 515       | 206                         | NR               | 645       | 175                         | NR               | 775       | 3                           | NR               | 905       | 0                           | NR               |
| 390       | 0                           | NR               | 520       | 213                         | NR               | 650       | 156                         | NR               | 780       | 2                           | NR               | 910       | 0                           | NR               |
| 395       | 1                           | NR               | 525       | 219                         | NR               | 655       | 127                         | NR               | 785       | 2                           | NR               | 915       | 0                           | NR               |
| 400       | 2                           | NR               | 530       | 223                         | NR               | 660       | 108                         | NR               | 790       | 2                           | NR               | 920       | 0                           | NR               |
| 405       | 2                           | NR               | 535       | 226                         | NR               | 665       | 89                          | NR               | 795       | 2                           | NR               | 925       | 0                           | NR               |
| 410       | 4                           | NR               | 540       | 230                         | NR               | 670       | 84                          | NR               | 800       | 1                           | NR               | 930       | 0                           | NR               |
| 415       | 6                           | NR               | 545       | 235                         | NR               | 675       | 67                          | NR               | 805       | 1                           | NR               | 935       | 0                           | NR               |
| 420       | 11                          | NR               | 550       | 239                         | NR               | 680       | 57                          | NR               | 810       | 1                           | NR               | 940       | 0                           | NR               |
| 425       | 19                          | NR               | 555       | 243                         | NR               | 685       | 50                          | NR               | 815       | 1                           | NR               | 945       | 0                           | NR               |
| 430       | 34                          | NR               | 560       | 248                         | NR               | 690       | 42                          | NR               | 820       | 1                           | NR               | 950       | 0                           | NR               |
| 435       | 60                          | NR               | 565       | 253                         | NR               | 695       | 36                          | NR               | 825       | 1                           | NR               | 955       | 0                           | NR               |
| 440       | 106                         | NR               | 570       | 256                         | NR               | 700       | 31                          | NR               | 830       | 0                           | NR               | 960       | 0                           | NR               |
| 445       | 193                         | NR               | 575       | 260                         | NR               | 705       | 26                          | NR               | 835       | 0                           | NR               | 965       | 0                           | NR               |
| 450       | 283                         | NR               | 580       | 263                         | NR               | 710       | 22                          | NR               | 840       | 0                           | NR               | 970       | 0                           | NR               |
| 455       | 234                         | NR               | 585       | 266                         | NR               | 715       | 19                          | NR               | 845       | 0                           | NR               | 975       | 0                           | NR               |
| 460       | 157                         | NR               | 590       | 267                         | NR               | 720       | 16                          | NR               | 850       | 0                           | NR               | 980       | 0                           | NR               |
| 465       | 134                         | NR               | 595       | 266                         | NR               | 725       | 14                          | NR               | 855       | 0                           | NR               | 985       | 0                           | NR               |
| 470       | 107                         | NR               | 600       | 268                         | NR               | 730       | 12                          | NR               | 860       | 0                           | NR               | 990       | 0                           | NR               |
| 475       | 85                          | NR               | 605       | 269                         | NR               | 735       | 10                          | NR               | 865       | 0                           | NR               | 995       | 0                           | NR               |
| 480       | 85                          | NR               | 610       | 309                         | NR               | 740       | 8                           | NR               | 870       | 0                           | NR               | 1000      | 0                           | NR               |
| 485       | 96                          | NR               | 615       | 345                         | NR               | 745       | 7                           | NR               | 875       | 0                           | NR               |           |                             |                  |

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### Melanopic Flux vs. Wavelength



Melanopic Lumens: NR

M/P: 3.24

| 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       | 112                         | NR               | 620       | 281                         | NR               | 750       | 6                           | NR               | 880       | 0                           | NR               |
| 365       | 0                           | NR               | 495       | 134                         | NR               | 625       | 286                         | NR               | 755       | 5                           | NR               | 885       | 0                           | NR               |
| 370       | 0                           | NR               | 500       | 157                         | NR               | 630       | 1000                        | NR               | 760       | 4                           | NR               | 890       | 0                           | NR               |
| 375       | 0                           | NR               | 505       | 178                         | NR               | 635       | 695                         | NR               | 765       | 4                           | NR               | 895       | 0                           | NR               |
| 380       | 0                           | NR               | 510       | 193                         | NR               | 640       | 181                         | NR               | 770       | 3                           | NR               | 900       | 0                           | NR               |
| 385       | 0                           | NR               | 515       | 206                         | NR               | 645       | 175                         | NR               | 775       | 3                           | NR               | 905       | 0                           | NR               |
| 390       | 0                           | NR               | 520       | 213                         | NR               | 650       | 156                         | NR               | 780       | 2                           | NR               | 910       | 0                           | NR               |
| 395       | 1                           | NR               | 525       | 219                         | NR               | 655       | 127                         | NR               | 785       | 2                           | NR               | 915       | 0                           | NR               |
| 400       | 2                           | NR               | 530       | 223                         | NR               | 660       | 108                         | NR               | 790       | 2                           | NR               | 920       | 0                           | NR               |
| 405       | 2                           | NR               | 535       | 226                         | NR               | 665       | 89                          | NR               | 795       | 2                           | NR               | 925       | 0                           | NR               |
| 410       | 4                           | NR               | 540       | 230                         | NR               | 670       | 84                          | NR               | 800       | 1                           | NR               | 930       | 0                           | NR               |
| 415       | 6                           | NR               | 545       | 235                         | NR               | 675       | 67                          | NR               | 805       | 1                           | NR               | 935       | 0                           | NR               |
| 420       | 11                          | NR               | 550       | 239                         | NR               | 680       | 57                          | NR               | 810       | 1                           | NR               | 940       | 0                           | NR               |
| 425       | 19                          | NR               | 555       | 243                         | NR               | 685       | 50                          | NR               | 815       | 1                           | NR               | 945       | 0                           | NR               |
| 430       | 34                          | NR               | 560       | 248                         | NR               | 690       | 42                          | NR               | 820       | 1                           | NR               | 950       | 0                           | NR               |
| 435       | 60                          | NR               | 565       | 253                         | NR               | 695       | 36                          | NR               | 825       | 1                           | NR               | 955       | 0                           | NR               |
| 440       | 106                         | NR               | 570       | 256                         | NR               | 700       | 31                          | NR               | 830       | 0                           | NR               | 960       | 0                           | NR               |
| 445       | 193                         | NR               | 575       | 260                         | NR               | 705       | 26                          | NR               | 835       | 0                           | NR               | 965       | 0                           | NR               |
| 450       | 283                         | NR               | 580       | 263                         | NR               | 710       | 22                          | NR               | 840       | 0                           | NR               | 970       | 0                           | NR               |
| 455       | 234                         | NR               | 585       | 266                         | NR               | 715       | 19                          | NR               | 845       | 0                           | NR               | 975       | 0                           | NR               |
| 460       | 157                         | NR               | 590       | 267                         | NR               | 720       | 16                          | NR               | 850       | 0                           | NR               | 980       | 0                           | NR               |
| 465       | 134                         | NR               | 595       | 266                         | NR               | 725       | 14                          | NR               | 855       | 0                           | NR               | 985       | 0                           | NR               |
| 470       | 107                         | NR               | 600       | 268                         | NR               | 730       | 12                          | NR               | 860       | 0                           | NR               | 990       | 0                           | NR               |
| 475       | 85                          | NR               | 605       | 269                         | NR               | 735       | 10                          | NR               | 865       | 0                           | NR               | 995       | 0                           | NR               |
| 480       | 85                          | NR               | 610       | 309                         | NR               | 740       | 8                           | NR               | 870       | 0                           | NR               | 1000      | 0                           | NR               |
| 485       | 96                          | NR               | 615       | 345                         | NR               | 745       | 7                           | NR               | 875       | 0                           | NR               |           |                             |                  |

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TM-30-18

### Summary

$R_f = 92.6$   
 $R_g = 102$   
 $\text{CIE } R_a = 96.3$   
 $R_9 = 78.4$



### Color Vector Graphics



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

|            |            |             |            |
|------------|------------|-------------|------------|
| CES01 = 86 | CES26 = 94 | CES51 = 97  | CES76 = 88 |
| CES02 = 63 | CES27 = 93 | CES52 = 96  | CES77 = 88 |
| CES03 = 32 | CES28 = 96 | CES53 = 95  | CES78 = 84 |
| CES04 = 70 | CES29 = 95 | CES54 = 95  | CES79 = 92 |
| CES05 = 50 | CES30 = 96 | CES55 = 95  | CES80 = 92 |
| CES06 = 51 | CES31 = 95 | CES56 = 98  | CES81 = 77 |
| CES07 = 43 | CES32 = 87 | CES57 = 98  | CES82 = 96 |
| CES08 = 42 | CES33 = 97 | CES58 = 98  | CES83 = 95 |
| CES09 = 29 | CES34 = 93 | CES59 = 100 | CES84 = 95 |
| CES10 = 75 | CES35 = 96 | CES60 = 94  | CES85 = 82 |
| CES11 = 58 | CES36 = 84 | CES61 = 95  | CES86 = 84 |
| CES12 = 64 | CES37 = 93 | CES62 = 90  | CES87 = 92 |
| CES13 = 44 | CES38 = 91 | CES63 = 95  | CES88 = 99 |
| CES14 = 74 | CES39 = 98 | CES64 = 95  | CES89 = 86 |
| CES15 = 72 | CES40 = 96 | CES65 = 92  | CES90 = 98 |
| CES16 = 48 | CES41 = 97 | CES66 = 93  | CES91 = 77 |
| CES17 = 49 | CES42 = 90 | CES67 = 92  | CES92 = 81 |
| CES18 = 56 | CES43 = 91 | CES68 = 91  | CES93 = 88 |
| CES19 = 71 | CES44 = 99 | CES69 = 92  | CES94 = 78 |
| CES20 = 67 | CES45 = 94 | CES70 = 89  | CES95 = 86 |
| CES21 = 86 | CES46 = 95 | CES71 = 85  | CES96 = 93 |
| CES22 = 78 | CES47 = 90 | CES72 = 95  | CES97 = 93 |
| CES23 = 91 | CES48 = 96 | CES73 = 84  | CES98 = 96 |
| CES24 = 90 | CES49 = 93 | CES74 = 91  | CES99 = 97 |
| CES25 = 71 | CES50 = 97 | CES75 = 86  |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)