

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: P982727

Luminaire Tested: 22CZ-LD5-20-UNV-L935-HRP-CD1-U

Issue Date: 04/23/2025

**Test Information**

Test Method: LM-79-2019  
Report Number: P982727  
Test Lab: INNOVATION CENTER(P3)  
Issue Date: 04/23/2025  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: METALUX  
Catalog Number: 22CZ-LD5-20-UNV-L935-HRP-CD1-U  
Description: METALUX CRUZE 2x2 2000LM PACKAGE 90CRI 3500K TROFFER LENS WITH HRP FILM INSERT  
Light Source: 3500K CCT, 90 CRI LEDS  
Ballast/Driver: -

**Summary**

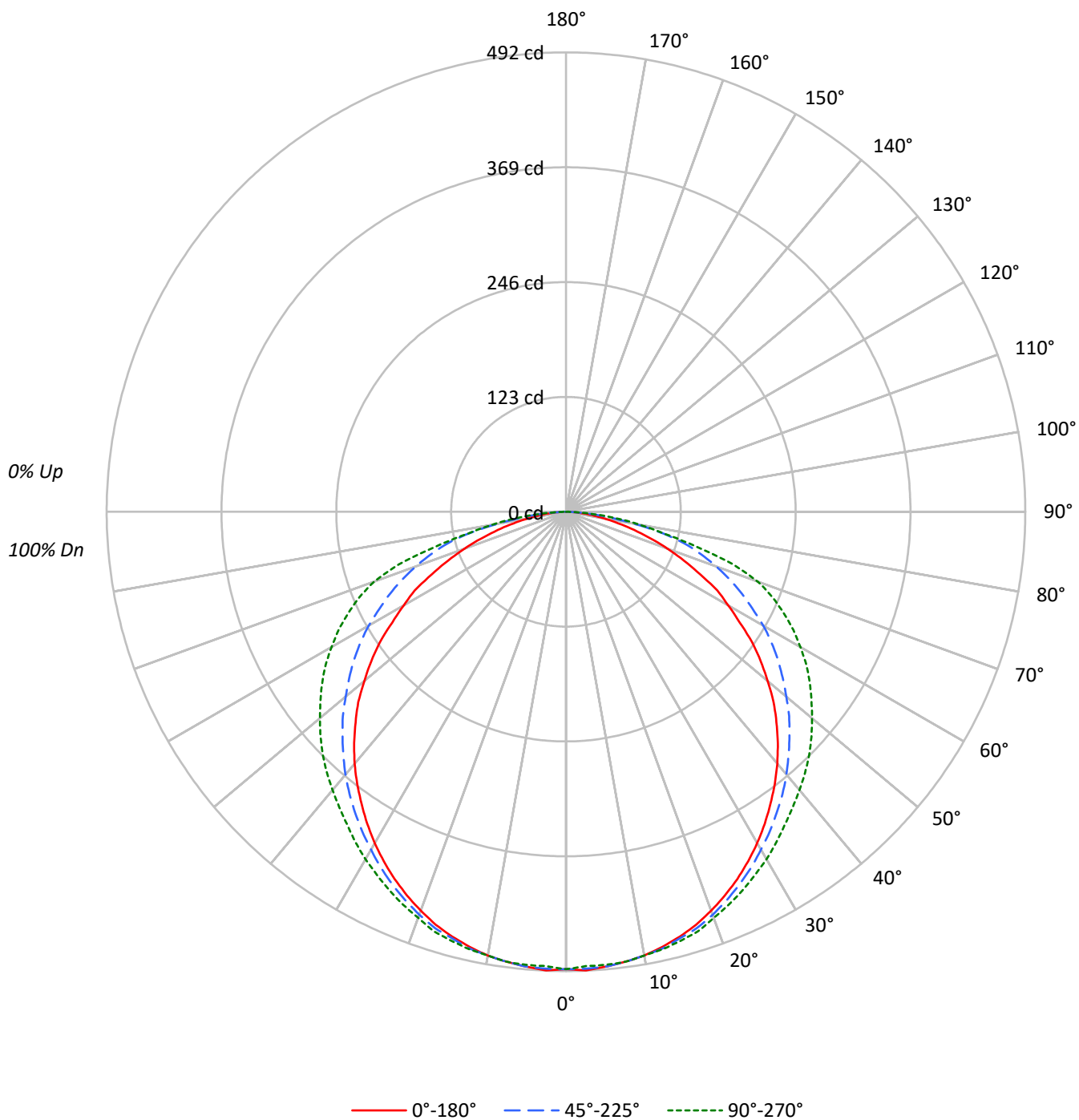
Lumens per Lamp: N/A  
Luminaire Lumens: 1504.4 lumens  
Efficiency: N/A  
Efficacy: 100.3 lumens/watt  
Spacing Criteria (0/90/45): 1.24 / 1.3 / 1.4  
Luminous Opening: Rectangular (W 2' x L: 2' x H: 0')  
CIE Type: Direct

Input Watts (W): 15  
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: P982727

CATALOG NUMBER: 22CZ-LD5-20-UNV-L935-HRP-CD1-U

### Luminous Intensity Polar Plot



TEST NUMBER: P982727

CATALOG NUMBER: 22CZ-LD5-20-UNV-L935-HRP-CD1-U

**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  | 73  |  | 80  | 76  | 72  |  | 77  |
| 3   | 89  | 78  | 69  | 63  | 86  | 76  | 68  | 62  | 73  | 67  | 61  |  | 71  | 65  | 60  |  | 68  |
| 4   | 81  | 69  | 60  | 53  | 79  | 67  | 59  | 52  | 65  | 57  | 52  |  | 63  | 56  | 51  |  | 60  |
| 5   | 75  | 61  | 52  | 45  | 72  | 60  | 51  | 45  | 58  | 50  | 44  |  | 56  | 49  | 44  |  | 54  |
| 6   | 69  | 55  | 46  | 39  | 67  | 54  | 45  | 39  | 52  | 44  | 39  |  | 50  | 44  | 38  |  | 49  |
| 7   | 64  | 50  | 41  | 34  | 62  | 49  | 40  | 34  | 47  | 40  | 34  |  | 46  | 39  | 34  |  | 45  |
| 8   | 59  | 45  | 37  | 31  | 58  | 45  | 36  | 31  | 43  | 36  | 30  |  | 42  | 35  | 30  |  | 41  |
| 9   | 55  | 42  | 33  | 28  | 54  | 41  | 33  | 27  | 40  | 32  | 27  |  | 39  | 32  | 27  |  | 38  |
| 10  | 52  | 38  | 30  | 25  | 50  | 38  | 30  | 25  | 37  | 30  | 25  |  | 36  | 29  | 25  |  | 35  |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 1318 | 1318 | 1318 |
| 5°  | 1321 | 1321 | 1316 |
| 10° | 1319 | 1319 | 1319 |
| 15° | 1312 | 1317 | 1325 |
| 20° | 1302 | 1315 | 1326 |
| 25° | 1289 | 1307 | 1329 |
| 30° | 1273 | 1298 | 1335 |
| 35° | 1254 | 1293 | 1343 |
| 40° | 1237 | 1291 | 1366 |
| 45° | 1213 | 1289 | 1402 |
| 50° | 1180 | 1289 | 1440 |
| 55° | 1141 | 1301 | 1496 |
| 60° | 1081 | 1314 | 1560 |
| 65° | 1009 | 1324 | 1640 |
| 70° | 914  | 1346 | 1721 |
| 75° | 786  | 1367 | 1508 |
| 80° | 642  | 1144 | 1243 |
| 85° | 528  | 834  | 917  |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 90°

Vertical Angle: 70°

Luminance: 1721 cd/sqm

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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 46.4   | 3.1       |
| 10°-20°   | 133.6  | 8.9       |
| 20°-30°   | 203.0  | 13.5      |
| 30°-40°   | 247.1  | 16.4      |
| 40°-50°   | 263.2  | 17.5      |
| 50°-60°   | 248.9  | 16.5      |
| 60°-70°   | 205.2  | 13.6      |
| 70°-80°   | 126.2  | 8.4       |
| 80°-90°   | 30.8   | 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°    | 383.0  | 25.5      |
| 0°-40°    | 630.1  | 41.9      |
| 0°-60°    | 1142.2 | 75.9      |
| 0°-90°    | 1504.4 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 1504.4 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°  | 22.5° | 45° | 67.5° | 90° | Flux |
|-----|-----|-------|-----|-------|-----|------|
| 0°  | 490 | 490   | 490 | 490   | 490 |      |
| 5°  | 489 | 489   | 489 | 488   | 487 | 46   |
| 15° | 471 | 472   | 473 | 475   | 476 | 133  |
| 25° | 434 | 436   | 440 | 445   | 448 | 200  |
| 35° | 382 | 385   | 394 | 403   | 409 | 239  |
| 45° | 319 | 324   | 339 | 358   | 368 | 246  |
| 55° | 243 | 252   | 277 | 304   | 319 | 216  |
| 65° | 158 | 174   | 208 | 241   | 258 | 157  |
| 75° | 76  | 96    | 132 | 143   | 145 | 81   |
| 85° | 17  | 22    | 27  | 29    | 30  | 20   |
| 90° | 0   | 0     | 0   | 0     | 0   |      |

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**CANDELA DISTRIBUTION (FULL):**

|       | 0°    | 22.5° | 45°   | 67.5° | 90°   |
|-------|-------|-------|-------|-------|-------|
| 0°    | 489.9 | 489.9 | 489.9 | 489.9 | 489.9 |
| 2.5°  | 491.7 | 490.8 | 489.9 | 488.1 | 487.1 |
| 5°    | 489.0 | 489.0 | 489.0 | 488.1 | 487.1 |
| 7.5°  | 486.2 | 486.2 | 486.2 | 486.2 | 486.2 |
| 10°   | 482.6 | 482.6 | 482.6 | 482.6 | 482.6 |
| 12.5° | 477.2 | 478.1 | 479.0 | 479.0 | 479.9 |
| 15°   | 471.0 | 471.9 | 472.8 | 474.6 | 475.5 |
| 17.5° | 463.8 | 464.7 | 467.4 | 469.2 | 471.0 |
| 20°   | 454.7 | 455.6 | 459.3 | 461.1 | 462.9 |
| 22.5° | 444.8 | 446.6 | 450.2 | 453.8 | 455.6 |
| 25°   | 434.1 | 435.8 | 440.3 | 444.8 | 447.5 |
| 27.5° | 422.3 | 424.1 | 429.6 | 435.8 | 438.5 |
| 30°   | 409.7 | 411.5 | 417.8 | 425.1 | 429.6 |
| 32.5° | 396.2 | 398.9 | 406.1 | 415.1 | 419.6 |
| 35°   | 381.8 | 385.4 | 393.6 | 403.4 | 408.8 |
| 37.5° | 367.4 | 371.0 | 380.9 | 392.6 | 398.9 |
| 40°   | 352.1 | 356.6 | 367.4 | 380.9 | 389.0 |
| 42.5° | 335.9 | 341.3 | 353.0 | 369.2 | 379.1 |
| 45°   | 318.8 | 324.2 | 338.6 | 357.5 | 368.3 |
| 47.5° | 301.7 | 308.0 | 324.2 | 344.9 | 356.6 |
| 50°   | 281.9 | 289.0 | 308.0 | 332.3 | 344.0 |
| 52.5° | 262.9 | 272.0 | 292.6 | 318.8 | 331.4 |
| 55°   | 243.2 | 252.1 | 277.4 | 304.4 | 318.8 |
| 57.5° | 220.6 | 231.4 | 261.1 | 289.9 | 305.3 |
| 60°   | 200.8 | 211.6 | 244.1 | 274.7 | 289.9 |
| 62.5° | 182.8 | 192.7 | 225.1 | 258.4 | 274.7 |
| 65°   | 158.5 | 173.8 | 208.0 | 241.4 | 257.5 |
| 67.5° | 136.8 | 154.0 | 190.0 | 221.5 | 239.6 |
| 70°   | 116.2 | 134.2 | 171.1 | 201.7 | 218.8 |
| 72.5° | 95.4  | 115.3 | 152.2 | 179.2 | 188.2 |
| 75°   | 75.6  | 96.3  | 131.5 | 143.2 | 145.0 |
| 77.5° | 57.6  | 78.3  | 106.2 | 105.3 | 107.1 |
| 80°   | 41.4  | 59.4  | 73.8  | 76.5  | 80.2  |
| 82.5° | 27.9  | 41.4  | 47.8  | 52.3  | 55.8  |
| 85°   | 17.1  | 22.5  | 27.0  | 28.8  | 29.7  |
| 87.5° | 8.1   | 9.0   | 9.0   | 7.2   | 7.2   |
| 90°   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |

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

Report Prepared for

Cooper Lighting Solutions

Metalux

Report Number: SP3-2508-516-6

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 (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    | 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 (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 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

$R_f = 92.6$   
 $R_g = 102$   
 $CIE R_a = 96.3$   
 $R_9 = 78.4$



### 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)