

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: FAIL-SAFE

Report Number: P1357074

Luminaire Tested: 3ASL4-5-1-65-UNV

Issue Date: 2/17/2026

**Test Information**

Test Method: LM-79-2019  
Report Number: P1357074  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-2511-597-6)  
Test Lab: INNOVATION CENTER  
Issue Date: 2/17/2026  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: FAIL-SAFE  
Catalog Number: 3ASL4-5-1-65-UNV  
Description: 3FT 500 LUMEN PER FOOT 4ASL LED LUMINAIRE WITH OPL LENS AND 6500K LEDS 1 ROW  
Light Source: -  
Ballast/Driver: -

**Summary**

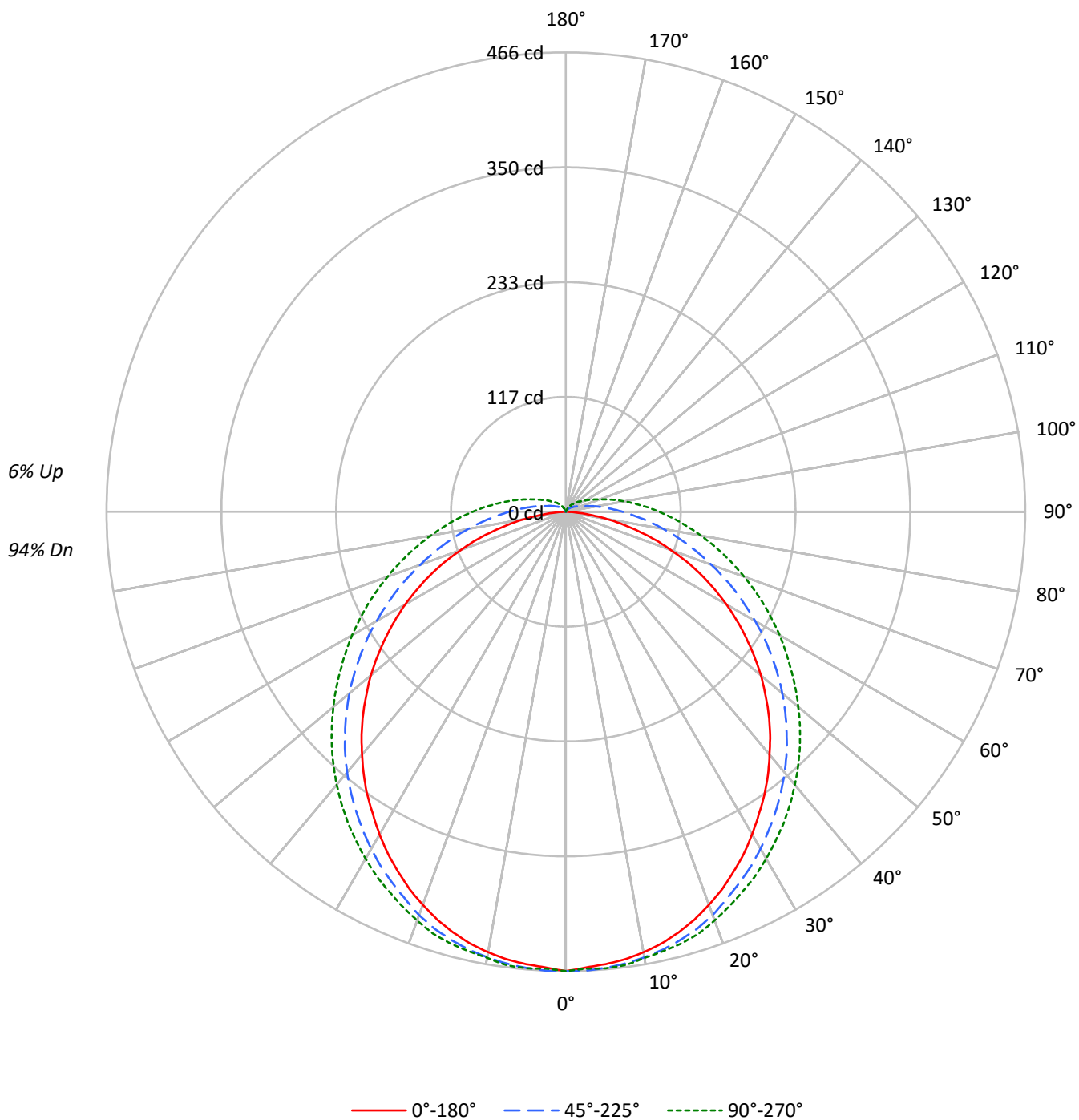
Lumens per Lamp: N/A  
Luminaire Lumens: 1560.0 lumens  
Efficiency: N/A  
Efficacy: 120.9 lumens/watt  
Spacing Criteria (0/90/45): 1.21 / 1.3 / 1.39  
Luminous Opening: Rectangular w/ Sides (W: 0.33' x L: 2.98' x H: 0.1')  
CIE Type: Direct

Input Watts (W): 12.9  
Input Voltage (V): NR  
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: 24 FT

TEST NUMBER: P1357074

CATALOG NUMBER: 3ASL4-5-1-65-UNV

### Luminous Intensity Polar Plot



TEST NUMBER: P1357074

CATALOG NUMBER: 3ASL4-5-1-65-UNV

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

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|
| RF  | 20  |     |     |     | 20  |     |     |     | 20  |     |     |     | 20  |     |    |    | 20 |    |    |    |
| RC  | 80  |     |     |     | 70  |     |     |     | 50  |     |     |     | 30  |     |    |    | 10 |    |    | 0  |
| RW  | 70  | 50  | 30  | 10  | 70  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50 | 30 | 10 | 50 | 30 | 10 |
| RCR |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |
| 0   | 118 | 118 | 118 | 118 | 114 | 114 | 114 | 114 | 108 | 108 | 108 | 102 | 102 | 102 | 96 | 96 | 96 | 94 |    |    |
| 1   | 106 | 100 | 95  | 91  | 102 | 97  | 93  | 89  | 92  | 88  | 85  | 87  | 84  | 81  | 82 | 80 | 78 | 75 |    |    |
| 2   | 95  | 86  | 79  | 73  | 92  | 84  | 77  | 71  | 79  | 74  | 69  | 75  | 70  | 66  | 71 | 67 | 64 | 61 |    |    |
| 3   | 87  | 76  | 67  | 60  | 84  | 73  | 65  | 59  | 69  | 63  | 57  | 66  | 60  | 55  | 62 | 58 | 54 | 51 |    |    |
| 4   | 79  | 67  | 57  | 50  | 76  | 65  | 56  | 50  | 62  | 54  | 48  | 58  | 52  | 47  | 56 | 50 | 46 | 43 |    |    |
| 5   | 73  | 59  | 50  | 43  | 70  | 58  | 49  | 43  | 55  | 47  | 42  | 52  | 46  | 41  | 50 | 44 | 40 | 37 |    |    |
| 6   | 67  | 53  | 44  | 38  | 65  | 52  | 43  | 37  | 50  | 42  | 36  | 47  | 41  | 35  | 45 | 39 | 35 | 32 |    |    |
| 7   | 62  | 48  | 39  | 33  | 60  | 47  | 39  | 33  | 45  | 37  | 32  | 43  | 36  | 31  | 41 | 35 | 31 | 29 |    |    |
| 8   | 58  | 44  | 35  | 29  | 56  | 43  | 35  | 29  | 41  | 34  | 29  | 39  | 33  | 28  | 38 | 32 | 27 | 25 |    |    |
| 9   | 54  | 40  | 32  | 26  | 52  | 39  | 32  | 26  | 38  | 31  | 26  | 36  | 30  | 25  | 35 | 29 | 25 | 23 |    |    |
| 10  | 51  | 37  | 29  | 24  | 49  | 36  | 29  | 24  | 35  | 28  | 23  | 34  | 27  | 23  | 32 | 27 | 22 | 21 |    |    |

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

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 5051 | 5051 | 5051 |
| 5°  | 4997 | 4947 | 4924 |
| 10° | 4964 | 4843 | 4794 |
| 15° | 4911 | 4734 | 4694 |
| 20° | 4833 | 4610 | 4569 |
| 25° | 4739 | 4463 | 4434 |
| 30° | 4636 | 4327 | 4309 |
| 35° | 4535 | 4190 | 4183 |
| 40° | 4419 | 4051 | 4054 |
| 45° | 4310 | 3898 | 3922 |
| 50° | 4181 | 3740 | 3782 |
| 55° | 4023 | 3562 | 3643 |
| 60° | 3847 | 3374 | 3522 |
| 65° | 3622 | 3178 | 3400 |
| 70° | 3276 | 2972 | 3281 |
| 75° | 2830 | 2788 | 3190 |
| 80° | 2224 | 2626 | 3134 |
| 85° | 1262 | 2515 | 3155 |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 0°

Vertical Angle: 45°

Luminance: 4310 cd/sqm

TEST NUMBER: P1357074

CATALOG NUMBER: 3ASL4-5-1-65-UNV

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 44.1   | 2.8       |
| 10°-20°   | 126.7  | 8.1       |
| 20°-30°   | 191.5  | 12.3      |
| 30°-40°   | 231.5  | 14.8      |
| 40°-50°   | 243.4  | 15.6      |
| 50°-60°   | 226.7  | 14.5      |
| 60°-70°   | 186.3  | 11.9      |
| 70°-80°   | 132.2  | 8.5       |
| 80°-90°   | 79.7   | 5.1       |
| 90°-100°  | 44.7   | 2.9       |
| 100°-110° | 24.7   | 1.6       |
| 110°-120° | 13.8   | 0.9       |
| 120°-130° | 8.0    | 0.5       |
| 130°-140° | 4.3    | 0.3       |
| 140°-150° | 1.9    | 0.1       |
| 150°-160° | 0.4    | 0.0       |
| 160°-170° | 0.0    | 0.0       |
| 170°-180° | 0.0    | 0.0       |
| <hr/>     |        |           |
| 0°-30°    | 362.3  | 23.2      |
| 0°-40°    | 593.8  | 38.1      |
| 0°-60°    | 1063.9 | 68.2      |
| 0°-90°    | 1462.1 | 93.7      |
| 90°-120°  | 83.2   | 5.3       |
| 90°-150°  | 97.4   | 6.2       |
| 90°-180°  | 98.0   | 6.3       |
| 0°-180°   | 1560.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|      | 0°  | 22.5° | 45° | 67.5° | 90° | Flux |
|------|-----|-------|-----|-------|-----|------|
| 0°   | 466 | 466   | 466 | 466   | 466 |      |
| 5°   | 461 | 465   | 464 | 464   | 465 | 44   |
| 15°  | 442 | 448   | 450 | 452   | 453 | 125  |
| 25°  | 403 | 410   | 416 | 422   | 425 | 186  |
| 35°  | 351 | 360   | 371 | 381   | 385 | 219  |
| 45°  | 291 | 302   | 317 | 330   | 336 | 224  |
| 55°  | 224 | 236   | 255 | 272   | 279 | 200  |
| 65°  | 152 | 166   | 189 | 211   | 221 | 150  |
| 75°  | 76  | 96    | 128 | 154   | 165 | 82   |
| 85°  | 14  | 41    | 77  | 105   | 116 | 18   |
| 90°  | 0   | 24    | 58  | 84    | 94  | 1    |
| 95°  | 0   | 14    | 42  | 66    | 76  | 0    |
| 105° | 0   | 5     | 22  | 40    | 47  | 0    |
| 115° | 0   | 3     | 14  | 24    | 29  | 0    |
| 125° | 0   | 2     | 8   | 16    | 18  | 0    |
| 135° | 0   | 0     | 5   | 10    | 13  | 0    |
| 145° | 0   | 0     | 2   | 6     | 7   | 0    |
| 155° | 0   | 0     | 0   | 2     | 2   | 0    |
| 165° | 0   | 0     | 0   | 0     | 0   | 0    |
| 175° | 0   | 0     | 0   | 0     | 0   | 0    |
| 180° | 0   | 0     | 0   | 0     | 0   | 0    |

TEST NUMBER: P1357074

CATALOG NUMBER: 3ASL4-5-1-65-UNV

**CANDELA DISTRIBUTION (FULL):**

|        | 0°    | 22.5° | 45°   | 67.5° | 90°   |
|--------|-------|-------|-------|-------|-------|
| 0°     | 466.0 | 466.0 | 466.0 | 466.0 | 466.0 |
| 2.5°   | 462.8 | 467.0 | 466.0 | 463.9 | 463.9 |
| 5°     | 460.7 | 464.9 | 464.4 | 463.9 | 464.9 |
| 7.5°   | 458.1 | 462.3 | 462.3 | 462.8 | 463.9 |
| 10°    | 453.8 | 459.1 | 459.1 | 459.1 | 459.6 |
| 12.5°  | 448.6 | 453.8 | 454.9 | 455.4 | 456.5 |
| 15°    | 441.7 | 447.5 | 449.6 | 451.7 | 453.3 |
| 17.5°  | 433.8 | 439.6 | 443.3 | 445.9 | 448.6 |
| 20°    | 424.3 | 430.6 | 435.4 | 438.5 | 441.2 |
| 22.5°  | 414.3 | 420.6 | 425.4 | 430.1 | 433.3 |
| 25°    | 402.7 | 410.1 | 415.9 | 421.7 | 424.8 |
| 27.5°  | 391.1 | 398.5 | 405.9 | 412.7 | 416.4 |
| 30°    | 377.9 | 386.4 | 394.8 | 402.7 | 406.4 |
| 32.5°  | 364.2 | 373.2 | 383.2 | 391.6 | 395.9 |
| 35°    | 351.1 | 360.0 | 371.1 | 380.6 | 385.3 |
| 37.5°  | 336.8 | 345.8 | 358.4 | 369.0 | 373.7 |
| 40°    | 321.5 | 331.5 | 345.3 | 356.3 | 361.6 |
| 42.5°  | 306.8 | 316.8 | 331.5 | 343.7 | 348.9 |
| 45°    | 291.0 | 301.5 | 316.8 | 330.0 | 335.8 |
| 47.5°  | 274.6 | 285.7 | 302.0 | 315.7 | 322.1 |
| 50°    | 258.3 | 269.9 | 286.7 | 301.5 | 307.8 |
| 52.5°  | 240.9 | 253.0 | 270.9 | 286.7 | 293.6 |
| 55°    | 223.5 | 236.1 | 254.6 | 271.5 | 278.8 |
| 57.5°  | 206.1 | 218.7 | 238.8 | 256.7 | 264.6 |
| 60°    | 188.2 | 201.4 | 221.9 | 241.4 | 250.4 |
| 62.5°  | 169.7 | 183.4 | 205.0 | 226.1 | 235.6 |
| 65°    | 151.8 | 165.5 | 189.2 | 211.4 | 221.4 |
| 67.5°  | 132.8 | 147.6 | 172.9 | 196.1 | 206.6 |
| 70°    | 113.3 | 130.2 | 157.1 | 181.9 | 192.4 |
| 72.5°  | 95.9  | 113.3 | 142.3 | 167.6 | 178.7 |
| 75°    | 76.4  | 95.9  | 127.6 | 153.9 | 165.0 |
| 77.5°  | 59.6  | 80.6  | 113.9 | 140.7 | 151.8 |
| 80°    | 42.7  | 65.9  | 100.7 | 128.1 | 139.2 |
| 82.5°  | 27.4  | 52.7  | 88.6  | 116.5 | 127.0 |
| 85°    | 14.2  | 41.1  | 77.0  | 105.4 | 116.0 |
| 87.5°  | 4.2   | 31.6  | 66.4  | 94.4  | 104.9 |
| 90°    | 0.0   | 24.2  | 57.5  | 84.3  | 94.4  |
| 92.5°  | 0.0   | 18.4  | 49.5  | 75.4  | 85.4  |
| 95°    | 0.0   | 14.2  | 42.2  | 66.4  | 75.9  |
| 97.5°  | 0.0   | 11.1  | 36.4  | 58.5  | 68.0  |
| 100°   | 0.0   | 9.0   | 31.1  | 51.7  | 60.6  |
| 102.5° | 0.0   | 7.4   | 26.9  | 45.9  | 53.8  |
| 105°   | 0.0   | 5.3   | 22.1  | 40.1  | 47.4  |
| 107.5° | 0.0   | 3.7   | 19.5  | 35.3  | 41.6  |
| 110°   | 0.0   | 3.2   | 17.4  | 30.6  | 36.9  |



TEST NUMBER: P1357074

CATALOG NUMBER: 3ASL4-5-1-65-UNV

**CANDELA DISTRIBUTION (continued):**

|        | 0°  | 22.5° | 45°  | 67.5° | 90°  |
|--------|-----|-------|------|-------|------|
| 112.5° | 0.0 | 2.6   | 15.3 | 27.4  | 32.7 |
| 115°   | 0.0 | 2.6   | 13.7 | 24.2  | 29.0 |
| 117.5° | 0.0 | 2.1   | 11.6 | 21.6  | 25.8 |
| 120°   | 0.0 | 2.1   | 10.5 | 19.5  | 23.2 |
| 122.5° | 0.0 | 1.6   | 9.5  | 17.4  | 21.1 |
| 125°   | 0.0 | 1.6   | 8.4  | 15.8  | 18.4 |
| 127.5° | 0.0 | 1.1   | 7.4  | 14.2  | 16.9 |
| 130°   | 0.0 | 1.1   | 6.9  | 12.7  | 15.3 |
| 132.5° | 0.0 | 0.5   | 6.3  | 11.6  | 13.7 |
| 135°   | 0.0 | 0.5   | 5.3  | 10.0  | 12.7 |
| 137.5° | 0.0 | 0.0   | 4.7  | 9.0   | 11.1 |
| 140°   | 0.0 | 0.0   | 3.7  | 7.9   | 10.0 |
| 142.5° | 0.5 | 0.0   | 3.2  | 6.9   | 8.4  |
| 145°   | 0.5 | 0.0   | 2.1  | 5.8   | 7.4  |
| 147.5° | 0.5 | 0.5   | 1.6  | 4.7   | 5.8  |
| 150°   | 0.5 | 0.5   | 1.1  | 3.2   | 4.7  |
| 152.5° | 0.5 | 0.5   | 0.5  | 2.1   | 3.2  |
| 155°   | 0.5 | 0.5   | 0.0  | 1.6   | 2.1  |
| 157.5° | 0.5 | 0.5   | 0.0  | 0.5   | 1.1  |
| 160°   | 0.5 | 0.5   | 0.0  | 0.0   | 0.5  |
| 162.5° | 0.0 | 0.0   | 0.0  | 0.0   | 0.0  |
| 165°   | 0.0 | 0.0   | 0.0  | 0.0   | 0.0  |
| 167.5° | 0.0 | 0.0   | 0.0  | 0.0   | 0.0  |
| 170°   | 0.0 | 0.0   | 0.0  | 0.0   | 0.0  |
| 172.5° | 0.0 | 0.0   | 0.0  | 0.0   | 0.0  |
| 175°   | 0.0 | 0.0   | 0.0  | 0.0   | 0.0  |
| 177.5° | 0.0 | 0.0   | 0.0  | 0.0   | 0.0  |
| 180°   | 0.0 | 0.0   | 0.0  | 0.0   | 0.0  |

TEST NUMBER: P1357074

CATALOG NUMBER: 3ASL4-5-1-65-UNV

**CIE UGR TABLE:**

| Reflectances:   |      |                  |       |       |       |       |                |       |       |       |       |
|-----------------|------|------------------|-------|-------|-------|-------|----------------|-------|-------|-------|-------|
| Ceiling         |      | 0.7              | 0.7   | 0.5   | 0.5   | 0.3   | 0.7            | 0.7   | 0.5   | 0.5   | 0.3   |
| Wall            |      | 0.5              | 0.3   | 0.5   | 0.3   | 0.3   | 0.5            | 0.3   | 0.5   | 0.3   | 0.3   |
| Reference plane |      | 0.2              | 0.2   | 0.2   | 0.2   | 0.2   | 0.2            | 0.2   | 0.2   | 0.2   | 0.2   |
| Room dimensions |      | Viewed crosswise |       |       |       |       | Viewed endwise |       |       |       |       |
| X=2H            | Y=2H | 15.02            | 16.57 | 15.48 | 17.01 | 17.48 | 16.97          | 18.53 | 17.43 | 18.97 | 19.44 |
|                 | 3H   | 16.51            | 17.93 | 16.98 | 18.38 | 18.89 | 19.37          | 20.79 | 19.85 | 21.24 | 21.75 |
|                 | 4H   | 16.99            | 18.33 | 17.48 | 18.80 | 19.32 | 20.53          | 21.87 | 21.02 | 22.34 | 22.86 |
|                 | 6H   | 17.27            | 18.51 | 17.77 | 19.00 | 19.54 | 21.72          | 22.97 | 22.23 | 23.45 | 23.99 |
|                 | 8H   | 17.32            | 18.51 | 17.84 | 19.02 | 19.57 | 22.33          | 23.52 | 22.85 | 24.03 | 24.58 |
|                 | 12H  | 17.33            | 18.48 | 17.86 | 18.98 | 19.56 | 22.99          | 24.14 | 23.51 | 24.64 | 25.21 |
| 4H              | 2H   | 15.88            | 17.22 | 16.37 | 17.69 | 18.21 | 17.41          | 18.75 | 17.90 | 19.22 | 19.74 |
|                 | 3H   | 17.61            | 18.75 | 18.11 | 19.26 | 19.81 | 20.03          | 21.17 | 20.54 | 21.69 | 22.23 |
|                 | 4H   | 18.21            | 19.25 | 18.73 | 19.78 | 20.35 | 21.36          | 22.40 | 21.88 | 22.93 | 23.50 |
|                 | 6H   | 18.60            | 19.53 | 19.15 | 20.08 | 20.67 | 22.74          | 23.66 | 23.28 | 24.21 | 24.80 |
|                 | 8H   | 18.70            | 19.56 | 19.25 | 20.12 | 20.72 | 23.45          | 24.32 | 24.00 | 24.87 | 25.47 |
|                 | 12H  | 18.74            | 19.53 | 19.31 | 20.11 | 20.72 | 24.23          | 25.02 | 24.81 | 25.60 | 26.21 |
| 8H              | 4H   | 18.85            | 19.72 | 19.40 | 20.27 | 20.88 | 21.57          | 22.44 | 22.12 | 22.99 | 23.59 |
|                 | 6H   | 19.42            | 20.16 | 20.00 | 20.75 | 21.36 | 23.12          | 23.85 | 23.70 | 24.45 | 25.06 |
|                 | 8H   | 19.60            | 20.26 | 20.19 | 20.87 | 21.49 | 23.97          | 24.63 | 24.56 | 25.24 | 25.86 |
|                 | 12H  | 19.71            | 20.30 | 20.30 | 20.89 | 21.58 | 24.93          | 25.53 | 25.53 | 26.12 | 26.81 |
| 12H             | 4H   | 19.03            | 19.82 | 19.60 | 20.40 | 21.01 | 21.58          | 22.37 | 22.15 | 22.95 | 23.56 |
|                 | 6H   | 19.69            | 20.36 | 20.29 | 20.96 | 21.58 | 23.15          | 23.82 | 23.75 | 24.42 | 25.04 |
|                 | 8H   | 19.96            | 20.55 | 20.56 | 21.15 | 21.84 | 24.07          | 24.66 | 24.67 | 25.26 | 25.95 |



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

Report Prepared for

Cooper Lighting Solutions

Fail-Safe

Report Number: SP1-2511-597-6

Test Date: 11/18/2025

Luminaire Tested: 4ASL-2-65-UNV-OPL-1\_600mA

Data in this report applies to families of products including 4ASL

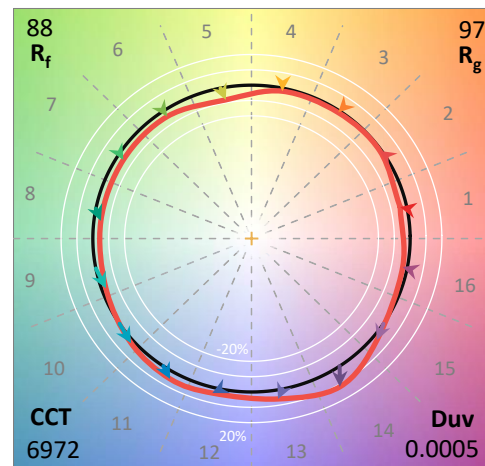
### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2511-597-6  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 11/18/2025  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: Fail-Safe  
 Catalog Number: **4ASL-2-65-UNV-OPL-1\_600mA**  
 Description: 2foot 4ASL LED LUMINAIRE WITH OPL LENS AND 6500K LEDS with 1 rows at 600mA

### Spectral Parameters

CCT (K): 6972  
 CIE  $u'$ : 0.1979  
 CIE  $v'$ : 0.4612  
 Duv: 0.0005  
 CIE x: 0.3066  
 CIE y: 0.3177  
 CIE z: 0.3758  
 Peak Wavelength (nm): 455  
 Dominant Wavelength (nm): 483  
 Purity: 10.33335  
 R<sub>f</sub>: 88.2  
 R<sub>g</sub>: 97.1

CRI (Ra): 94.3  
 R1: 96.1  
 R2: 98.8  
 R3: 96.4  
 R4: 92.8  
 R5: 92.9  
 R6: 92.2  
 R7: 93.5  
 R8: 91.4  
 R9: 82.6  
 R10: 95.4  
 R11: 95.2  
 R12: 63.5  
 R13: 99.3  
 R14: 98.1  
 R15: 93.7



### Test Conditions

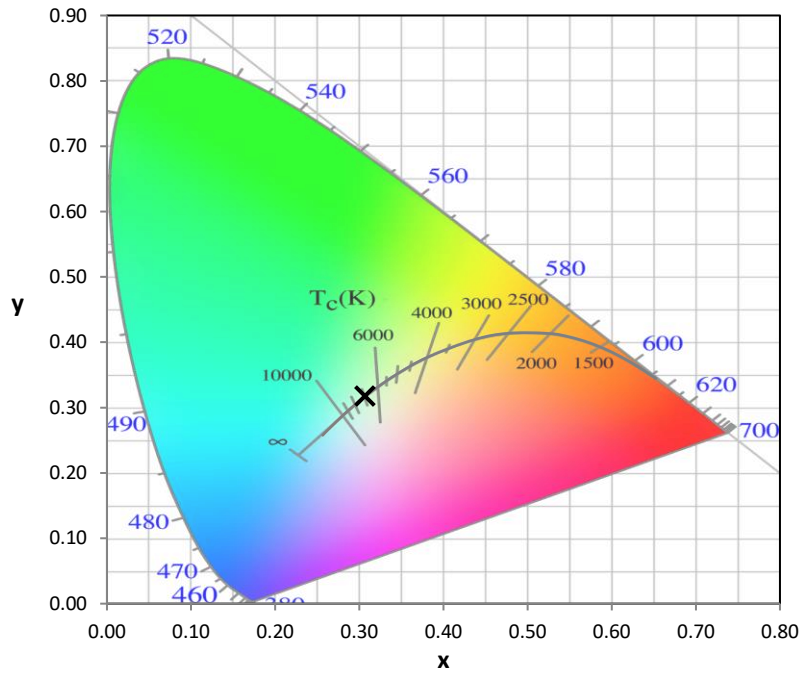
Stabilization Time: 20M  
 Operation Time: 1H 20M  
 Sphere Temperature (°C): 24.1

REPORT NUMBER: SP1-2511-597-6

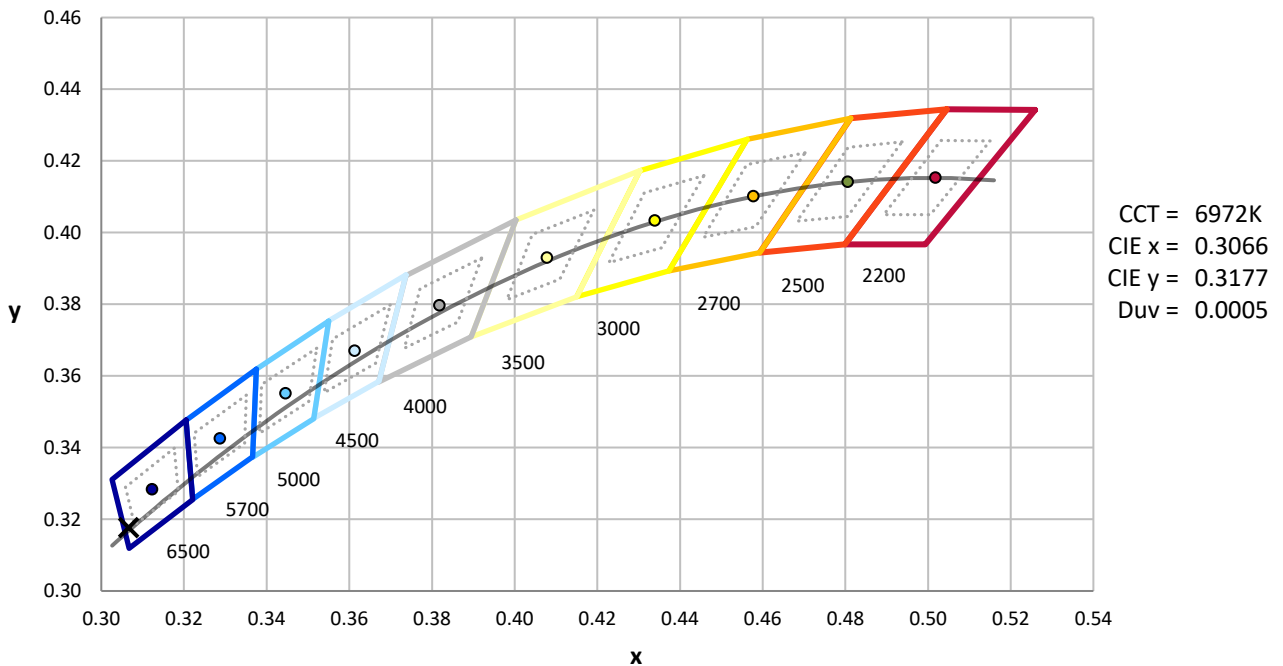
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | 76INCH SPHERE IN0058  | 6/16/2025        | 12/16/2025           |
| Power Meter                    | XITRON INXT2011004    | 10/21/2025       | 10/21/2026           |
| AC Power Source                | CHROMA 61603 IN0063   | 10/21/2025       | 10/21/2026           |
| DC Power Source                | AGILENT E3634A IN0208 | 10/21/2025       | 10/21/2026           |
| Sphere Thermometer             | ONSET IN0085          | 10/21/2025       | 10/21/2026           |
| Room Thermometer               | ONSET IN0046          | 10/21/2025       | 10/21/2026           |

REPORT NUMBER: SP1-2511-597-6

**CIE 1931 Chromaticity Diagram**



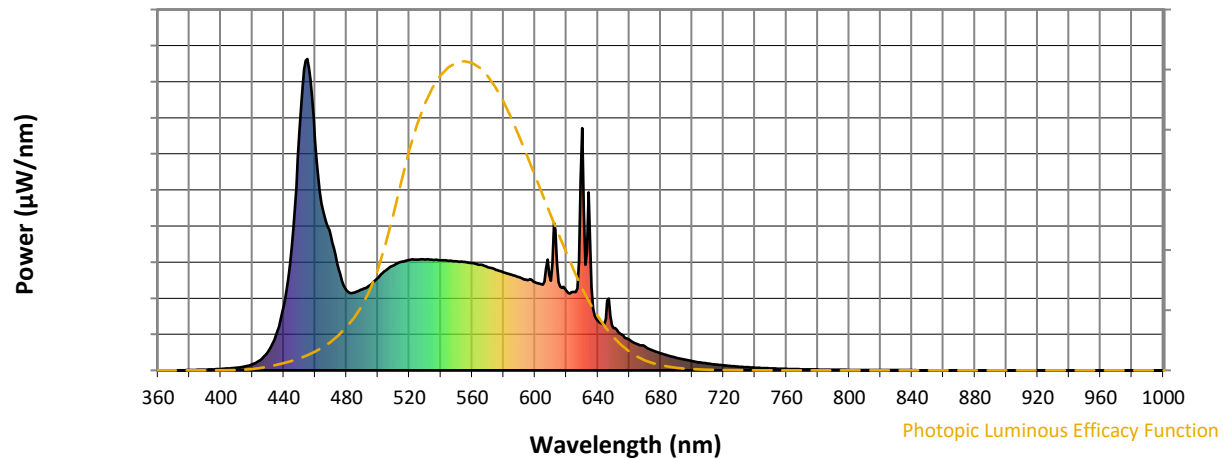
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 6500K 7-step quadrangle

REPORT NUMBER: SP1-2511-597-6

### Photopic Flux vs. Wavelength

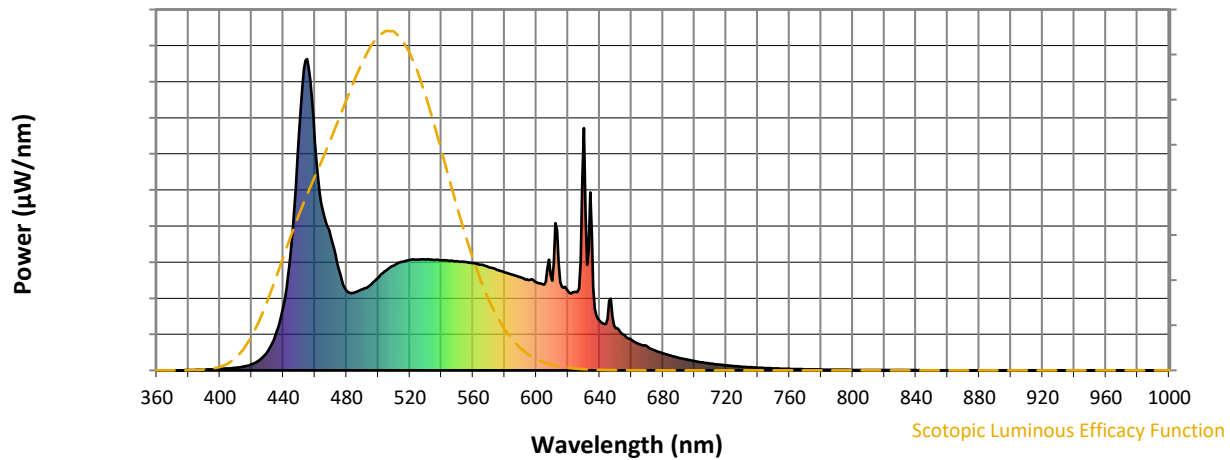


### Photopic Lumens: NR

| λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>λ</sup> /nm | Lumens (φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 260                      | NR            | 620    | 255                      | NR            | 750    | 6                        | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 274                      | NR            | 625    | 252                      | NR            | 755    | 6                        | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 297                      | NR            | 630    | 778                      | NR            | 760    | 5                        | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 320                      | NR            | 635    | 431                      | NR            | 765    | 4                        | NR            | 895    | 0                        | NR            |
| 380    | 1                        | NR            | 510    | 337                      | NR            | 640    | 160                      | NR            | 770    | 4                        | NR            | 900    | 0                        | NR            |
| 385    | 2                        | NR            | 515    | 349                      | NR            | 645    | 165                      | NR            | 775    | 3                        | NR            | 905    | 0                        | NR            |
| 390    | 2                        | NR            | 520    | 354                      | NR            | 650    | 135                      | NR            | 780    | 3                        | NR            | 910    | 0                        | NR            |
| 395    | 3                        | NR            | 525    | 356                      | NR            | 655    | 115                      | NR            | 785    | 2                        | NR            | 915    | 0                        | NR            |
| 400    | 5                        | NR            | 530    | 356                      | NR            | 660    | 99                       | NR            | 790    | 2                        | NR            | 920    | 0                        | NR            |
| 405    | 6                        | NR            | 535    | 355                      | NR            | 665    | 84                       | NR            | 795    | 2                        | NR            | 925    | 0                        | NR            |
| 410    | 8                        | NR            | 540    | 354                      | NR            | 670    | 77                       | NR            | 800    | 2                        | NR            | 930    | 0                        | NR            |
| 415    | 12                       | NR            | 545    | 351                      | NR            | 675    | 64                       | NR            | 805    | 1                        | NR            | 935    | 0                        | NR            |
| 420    | 19                       | NR            | 550    | 350                      | NR            | 680    | 55                       | NR            | 810    | 1                        | NR            | 940    | 0                        | NR            |
| 425    | 33                       | NR            | 555    | 348                      | NR            | 685    | 47                       | NR            | 815    | 1                        | NR            | 945    | 0                        | NR            |
| 430    | 60                       | NR            | 560    | 344                      | NR            | 690    | 41                       | NR            | 820    | 1                        | NR            | 950    | 0                        | NR            |
| 435    | 113                      | NR            | 565    | 339                      | NR            | 695    | 35                       | NR            | 825    | 1                        | NR            | 955    | 0                        | NR            |
| 440    | 206                      | NR            | 570    | 331                      | NR            | 700    | 30                       | NR            | 830    | 1                        | NR            | 960    | 0                        | NR            |
| 445    | 392                      | NR            | 575    | 323                      | NR            | 705    | 26                       | NR            | 835    | 1                        | NR            | 965    | 0                        | NR            |
| 450    | 764                      | NR            | 580    | 315                      | NR            | 710    | 22                       | NR            | 840    | 1                        | NR            | 970    | 0                        | NR            |
| 455    | 1000                     | NR            | 585    | 307                      | NR            | 715    | 19                       | NR            | 845    | 0                        | NR            | 975    | 0                        | NR            |
| 460    | 736                      | NR            | 590    | 299                      | NR            | 720    | 16                       | NR            | 850    | 0                        | NR            | 980    | 0                        | NR            |
| 465    | 513                      | NR            | 595    | 290                      | NR            | 725    | 14                       | NR            | 855    | 0                        | NR            | 985    | 0                        | NR            |
| 470    | 430                      | NR            | 600    | 282                      | NR            | 730    | 12                       | NR            | 860    | 0                        | NR            | 990    | 0                        | NR            |
| 475    | 325                      | NR            | 605    | 276                      | NR            | 735    | 10                       | NR            | 865    | 0                        | NR            | 995    | 0                        | NR            |
| 480    | 256                      | NR            | 610    | 287                      | NR            | 740    | 9                        | NR            | 870    | 0                        | NR            | 1000   | 0                        | NR            |
| 485    | 250                      | NR            | 615    | 284                      | NR            | 745    | 7                        | NR            | 875    | 0                        | NR            |        |                          |               |

REPORT NUMBER: SP1-2511-597-6

### Scotopic Flux vs. Wavelength



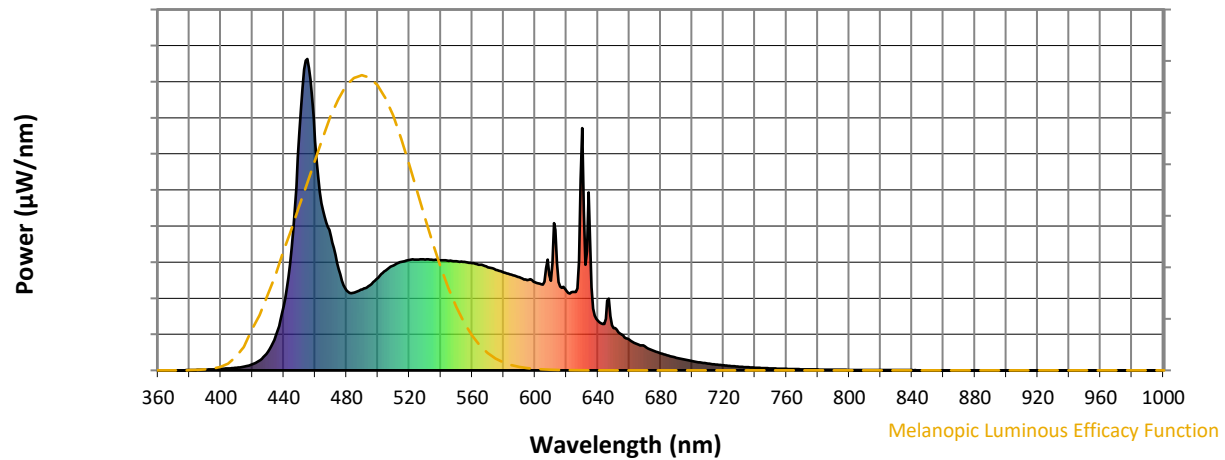
Scotopic Lumens: NR

S/P: 2.48

| 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       | 260                         | NR               | 620       | 255                         | NR               | 750       | 6                           | NR               | 880       | 0                           | NR               |
| 365       | 0                           | NR               | 495       | 274                         | NR               | 625       | 252                         | NR               | 755       | 6                           | NR               | 885       | 0                           | NR               |
| 370       | 0                           | NR               | 500       | 297                         | NR               | 630       | 778                         | NR               | 760       | 5                           | NR               | 890       | 0                           | NR               |
| 375       | 0                           | NR               | 505       | 320                         | NR               | 635       | 431                         | NR               | 765       | 4                           | NR               | 895       | 0                           | NR               |
| 380       | 1                           | NR               | 510       | 337                         | NR               | 640       | 160                         | NR               | 770       | 4                           | NR               | 900       | 0                           | NR               |
| 385       | 2                           | NR               | 515       | 349                         | NR               | 645       | 165                         | NR               | 775       | 3                           | NR               | 905       | 0                           | NR               |
| 390       | 2                           | NR               | 520       | 354                         | NR               | 650       | 135                         | NR               | 780       | 3                           | NR               | 910       | 0                           | NR               |
| 395       | 3                           | NR               | 525       | 356                         | NR               | 655       | 115                         | NR               | 785       | 2                           | NR               | 915       | 0                           | NR               |
| 400       | 5                           | NR               | 530       | 356                         | NR               | 660       | 99                          | NR               | 790       | 2                           | NR               | 920       | 0                           | NR               |
| 405       | 6                           | NR               | 535       | 355                         | NR               | 665       | 84                          | NR               | 795       | 2                           | NR               | 925       | 0                           | NR               |
| 410       | 8                           | NR               | 540       | 354                         | NR               | 670       | 77                          | NR               | 800       | 2                           | NR               | 930       | 0                           | NR               |
| 415       | 12                          | NR               | 545       | 351                         | NR               | 675       | 64                          | NR               | 805       | 1                           | NR               | 935       | 0                           | NR               |
| 420       | 19                          | NR               | 550       | 350                         | NR               | 680       | 55                          | NR               | 810       | 1                           | NR               | 940       | 0                           | NR               |
| 425       | 33                          | NR               | 555       | 348                         | NR               | 685       | 47                          | NR               | 815       | 1                           | NR               | 945       | 0                           | NR               |
| 430       | 60                          | NR               | 560       | 344                         | NR               | 690       | 41                          | NR               | 820       | 1                           | NR               | 950       | 0                           | NR               |
| 435       | 113                         | NR               | 565       | 339                         | NR               | 695       | 35                          | NR               | 825       | 1                           | NR               | 955       | 0                           | NR               |
| 440       | 206                         | NR               | 570       | 331                         | NR               | 700       | 30                          | NR               | 830       | 1                           | NR               | 960       | 0                           | NR               |
| 445       | 392                         | NR               | 575       | 323                         | NR               | 705       | 26                          | NR               | 835       | 1                           | NR               | 965       | 0                           | NR               |
| 450       | 764                         | NR               | 580       | 315                         | NR               | 710       | 22                          | NR               | 840       | 1                           | NR               | 970       | 0                           | NR               |
| 455       | 1000                        | NR               | 585       | 307                         | NR               | 715       | 19                          | NR               | 845       | 0                           | NR               | 975       | 0                           | NR               |
| 460       | 736                         | NR               | 590       | 299                         | NR               | 720       | 16                          | NR               | 850       | 0                           | NR               | 980       | 0                           | NR               |
| 465       | 513                         | NR               | 595       | 290                         | NR               | 725       | 14                          | NR               | 855       | 0                           | NR               | 985       | 0                           | NR               |
| 470       | 430                         | NR               | 600       | 282                         | NR               | 730       | 12                          | NR               | 860       | 0                           | NR               | 990       | 0                           | NR               |
| 475       | 325                         | NR               | 605       | 276                         | NR               | 735       | 10                          | NR               | 865       | 0                           | NR               | 995       | 0                           | NR               |
| 480       | 256                         | NR               | 610       | 287                         | NR               | 740       | 9                           | NR               | 870       | 0                           | NR               | 1000      | 0                           | NR               |
| 485       | 250                         | NR               | 615       | 284                         | NR               | 745       | 7                           | NR               | 875       | 0                           | NR               |           |                             |                  |

REPORT NUMBER: SP1-2511-597-6

### Melanopic Flux vs. Wavelength


**Melanopic Lumens: NR**
**M/P: 5.67**

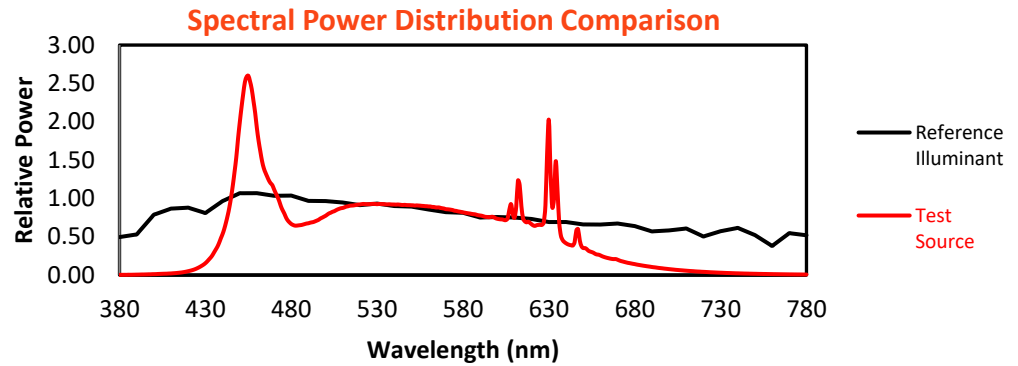
| λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>(φ/nm) |
|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|-----------|-----------------------------|------------------|
| 360       | 0                           | NR               | 490       | 260                         | NR               | 620       | 255                         | NR               | 750       | 6                           | NR               | 880       | 0                           | NR               |
| 365       | 0                           | NR               | 495       | 274                         | NR               | 625       | 252                         | NR               | 755       | 6                           | NR               | 885       | 0                           | NR               |
| 370       | 0                           | NR               | 500       | 297                         | NR               | 630       | 778                         | NR               | 760       | 5                           | NR               | 890       | 0                           | NR               |
| 375       | 0                           | NR               | 505       | 320                         | NR               | 635       | 431                         | NR               | 765       | 4                           | NR               | 895       | 0                           | NR               |
| 380       | 1                           | NR               | 510       | 337                         | NR               | 640       | 160                         | NR               | 770       | 4                           | NR               | 900       | 0                           | NR               |
| 385       | 2                           | NR               | 515       | 349                         | NR               | 645       | 165                         | NR               | 775       | 3                           | NR               | 905       | 0                           | NR               |
| 390       | 2                           | NR               | 520       | 354                         | NR               | 650       | 135                         | NR               | 780       | 3                           | NR               | 910       | 0                           | NR               |
| 395       | 3                           | NR               | 525       | 356                         | NR               | 655       | 115                         | NR               | 785       | 2                           | NR               | 915       | 0                           | NR               |
| 400       | 5                           | NR               | 530       | 356                         | NR               | 660       | 99                          | NR               | 790       | 2                           | NR               | 920       | 0                           | NR               |
| 405       | 6                           | NR               | 535       | 355                         | NR               | 665       | 84                          | NR               | 795       | 2                           | NR               | 925       | 0                           | NR               |
| 410       | 8                           | NR               | 540       | 354                         | NR               | 670       | 77                          | NR               | 800       | 2                           | NR               | 930       | 0                           | NR               |
| 415       | 12                          | NR               | 545       | 351                         | NR               | 675       | 64                          | NR               | 805       | 1                           | NR               | 935       | 0                           | NR               |
| 420       | 19                          | NR               | 550       | 350                         | NR               | 680       | 55                          | NR               | 810       | 1                           | NR               | 940       | 0                           | NR               |
| 425       | 33                          | NR               | 555       | 348                         | NR               | 685       | 47                          | NR               | 815       | 1                           | NR               | 945       | 0                           | NR               |
| 430       | 60                          | NR               | 560       | 344                         | NR               | 690       | 41                          | NR               | 820       | 1                           | NR               | 950       | 0                           | NR               |
| 435       | 113                         | NR               | 565       | 339                         | NR               | 695       | 35                          | NR               | 825       | 1                           | NR               | 955       | 0                           | NR               |
| 440       | 206                         | NR               | 570       | 331                         | NR               | 700       | 30                          | NR               | 830       | 1                           | NR               | 960       | 0                           | NR               |
| 445       | 392                         | NR               | 575       | 323                         | NR               | 705       | 26                          | NR               | 835       | 1                           | NR               | 965       | 0                           | NR               |
| 450       | 764                         | NR               | 580       | 315                         | NR               | 710       | 22                          | NR               | 840       | 1                           | NR               | 970       | 0                           | NR               |
| 455       | 1000                        | NR               | 585       | 307                         | NR               | 715       | 19                          | NR               | 845       | 0                           | NR               | 975       | 0                           | NR               |
| 460       | 736                         | NR               | 590       | 299                         | NR               | 720       | 16                          | NR               | 850       | 0                           | NR               | 980       | 0                           | NR               |
| 465       | 513                         | NR               | 595       | 290                         | NR               | 725       | 14                          | NR               | 855       | 0                           | NR               | 985       | 0                           | NR               |
| 470       | 430                         | NR               | 600       | 282                         | NR               | 730       | 12                          | NR               | 860       | 0                           | NR               | 990       | 0                           | NR               |
| 475       | 325                         | NR               | 605       | 276                         | NR               | 735       | 10                          | NR               | 865       | 0                           | NR               | 995       | 0                           | NR               |
| 480       | 256                         | NR               | 610       | 287                         | NR               | 740       | 9                           | NR               | 870       | 0                           | NR               | 1000      | 0                           | NR               |
| 485       | 250                         | NR               | 615       | 284                         | NR               | 745       | 7                           | NR               | 875       | 0                           | NR               |           |                             |                  |

REPORT NUMBER: SP1-2511-597-6

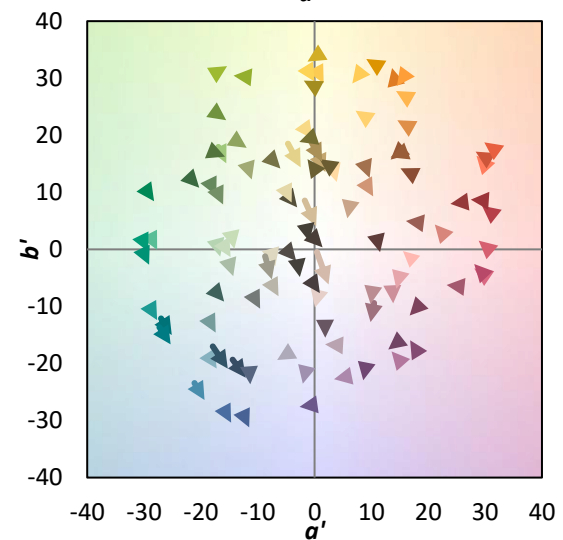
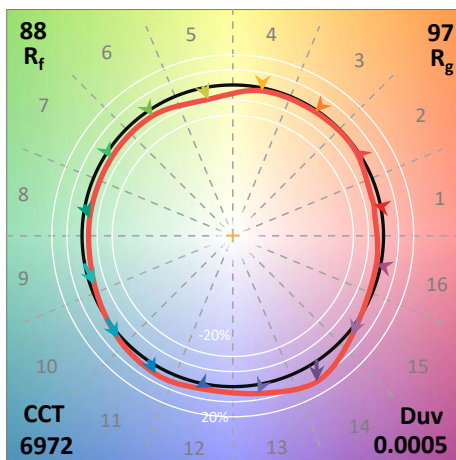
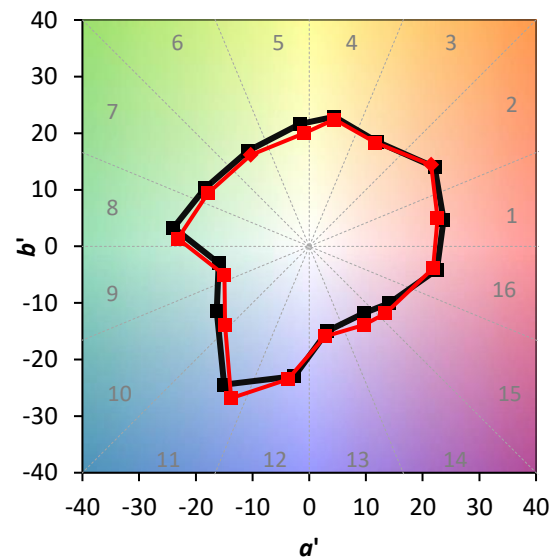
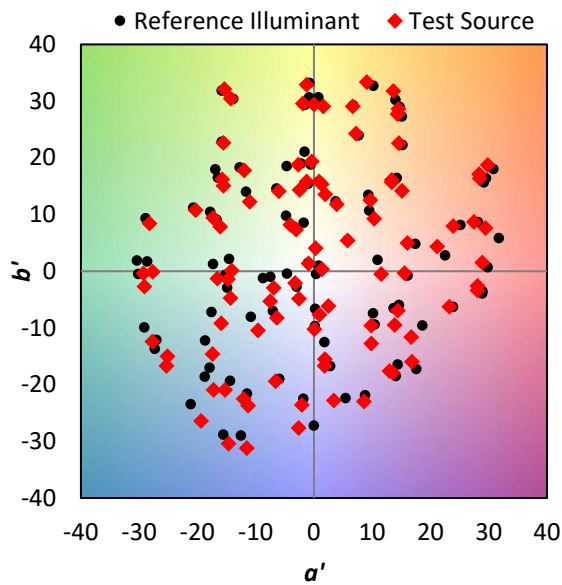
TM-30-18

### Summary

$R_f = 88.2$   
 $R_g = 97.1$   
 $CIE R_a = 94.3$   
 $R_9 = 82.6$



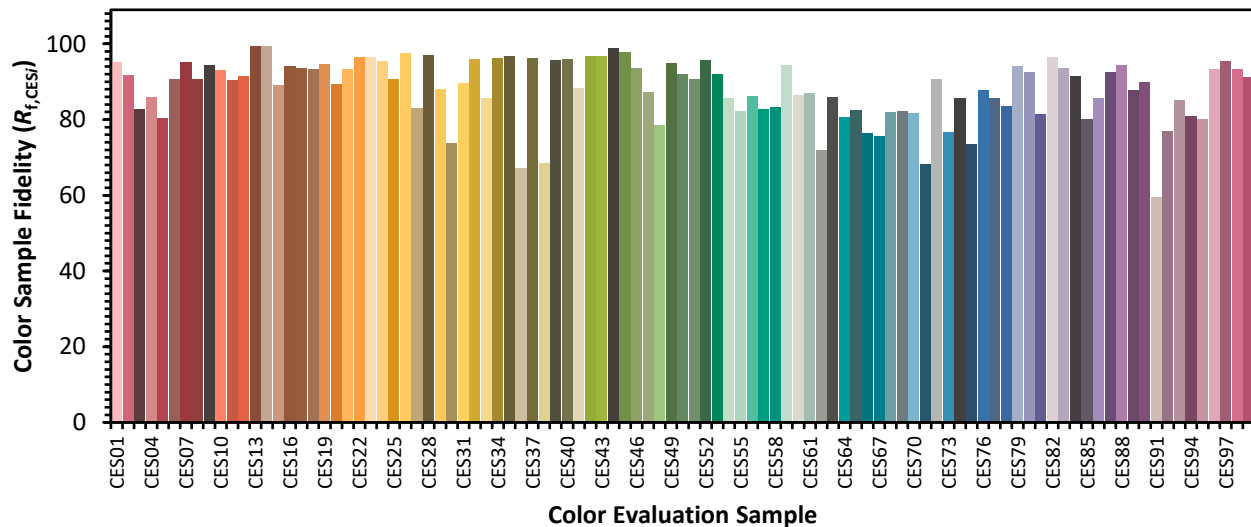
### Color Vector Graphics

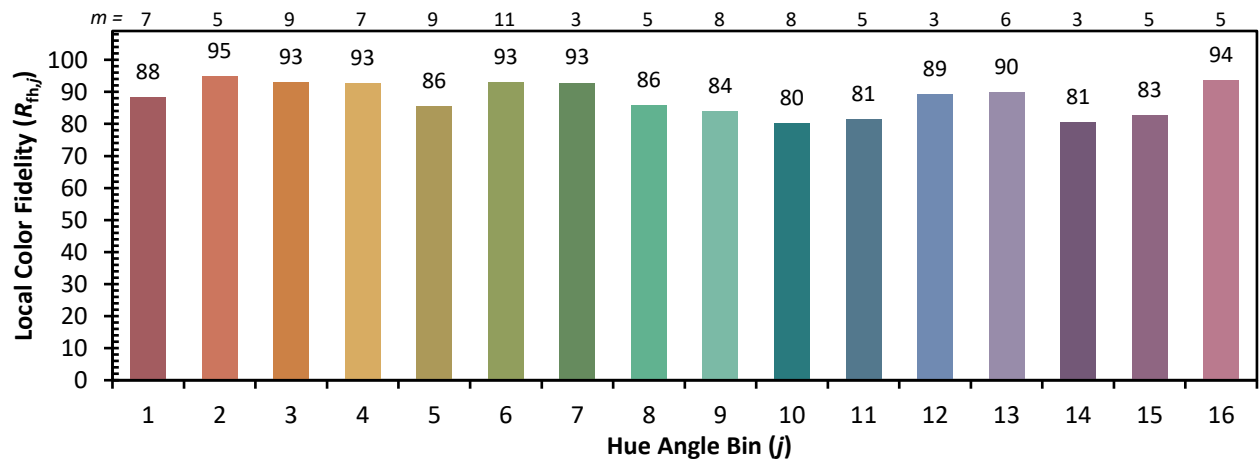
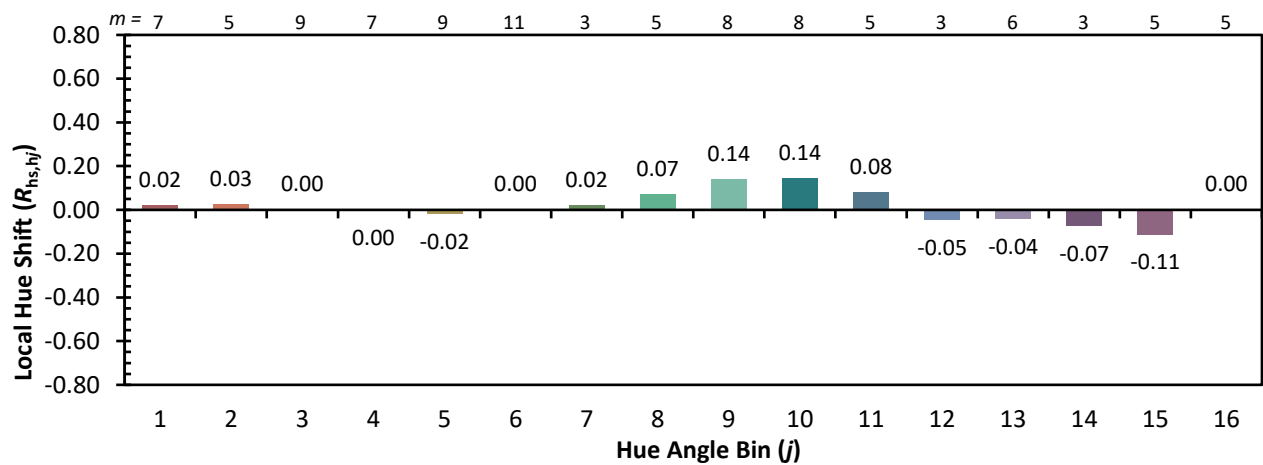
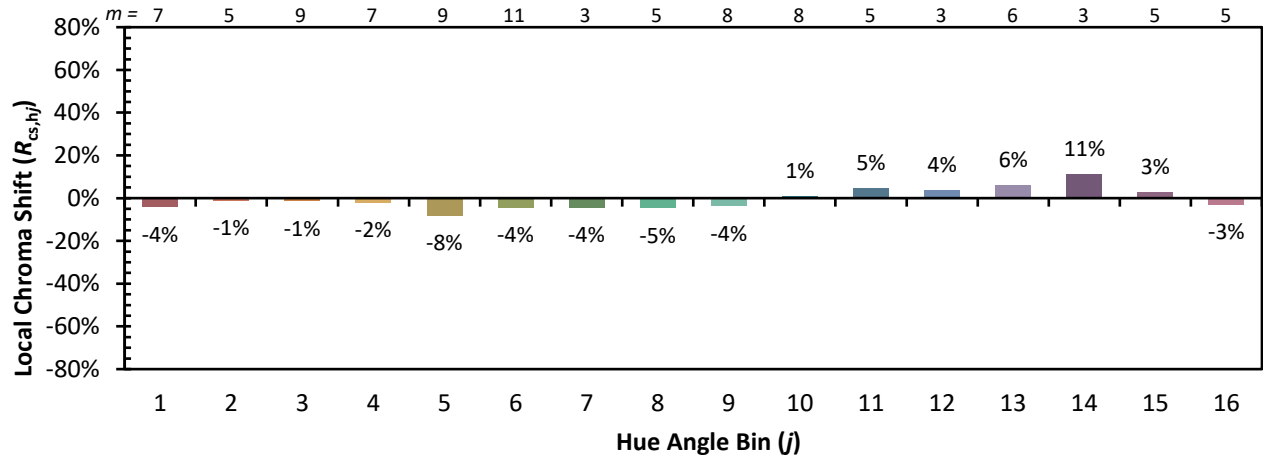




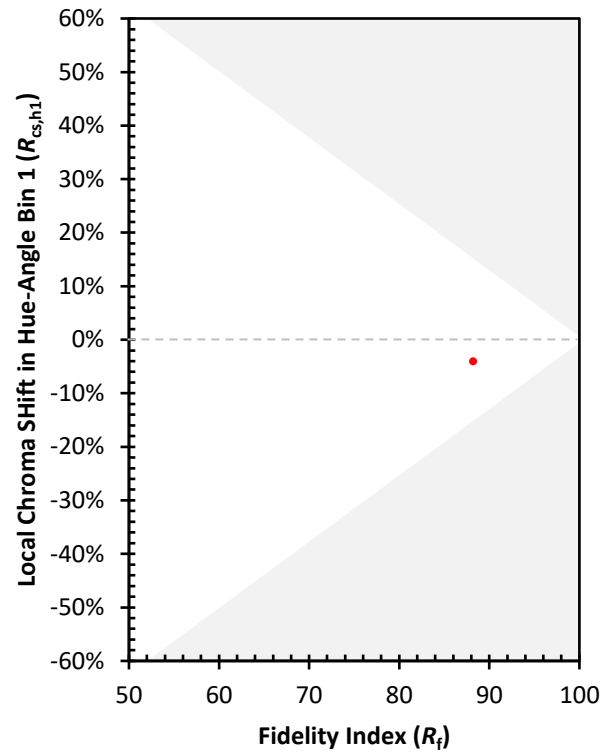
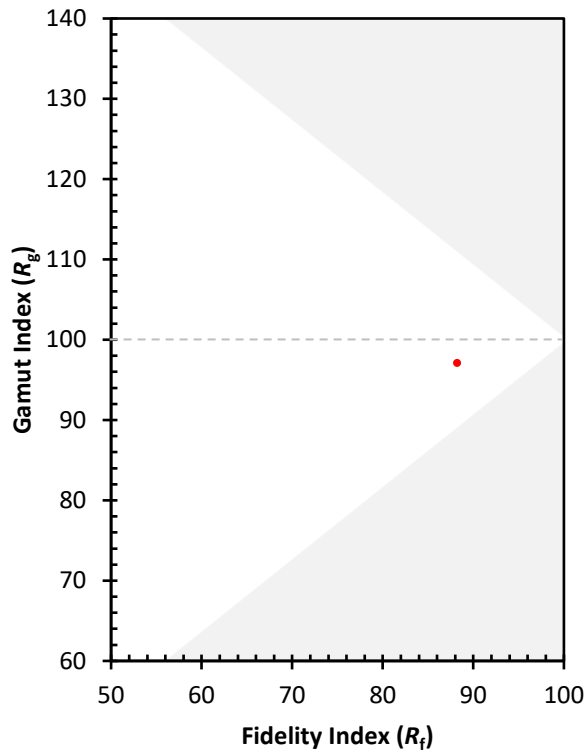
**Individual Sample Fidelity Index ( $R_{f,i}$ )**

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 97 | CES51 = 91 | CES76 = 88 |
| CES02 = 60 | CES27 = 83 | CES52 = 96 | CES77 = 86 |
| CES03 = 31 | CES28 = 97 | CES53 = 92 | CES78 = 83 |
| CES04 = 68 | CES29 = 88 | CES54 = 86 | CES79 = 94 |
| CES05 = 47 | CES30 = 74 | CES55 = 82 | CES80 = 93 |
| CES06 = 49 | CES31 = 90 | CES56 = 86 | CES81 = 81 |
| CES07 = 40 | CES32 = 96 | CES57 = 83 | CES82 = 96 |
| CES08 = 39 | CES33 = 86 | CES58 = 83 | CES83 = 94 |
| CES09 = 29 | CES34 = 96 | CES59 = 94 | CES84 = 91 |
| CES10 = 72 | CES35 = 97 | CES60 = 87 | CES85 = 80 |
| CES11 = 55 | CES36 = 67 | CES61 = 87 | CES86 = 86 |
| CES12 = 61 | CES37 = 96 | CES62 = 72 | CES87 = 93 |
| CES13 = 42 | CES38 = 68 | CES63 = 86 | CES88 = 94 |
| CES14 = 74 | CES39 = 96 | CES64 = 81 | CES89 = 88 |
| CES15 = 71 | CES40 = 96 | CES65 = 83 | CES90 = 90 |
| CES16 = 46 | CES41 = 88 | CES66 = 76 | CES91 = 60 |
| CES17 = 48 | CES42 = 97 | CES67 = 76 | CES92 = 77 |
| CES18 = 55 | CES43 = 97 | CES68 = 82 | CES93 = 85 |
| CES19 = 69 | CES44 = 99 | CES69 = 82 | CES94 = 81 |
| CES20 = 64 | CES45 = 98 | CES70 = 82 | CES95 = 80 |
| CES21 = 84 | CES46 = 93 | CES71 = 68 | CES96 = 93 |
| CES22 = 76 | CES47 = 87 | CES72 = 91 | CES97 = 95 |
| CES23 = 91 | CES48 = 79 | CES73 = 77 | CES98 = 93 |
| CES24 = 89 | CES49 = 95 | CES74 = 86 | CES99 = 91 |
| CES25 = 69 | CES50 = 92 | CES75 = 74 |            |



**Color Rendition by Hue-Angle Bin**


**Measure Comparisons**



(END OF REPORT)