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: P1357073

Luminaire Tested: 3ASL4-5-1-50-UNV

Issue Date: 2/17/2026

**Test Information**

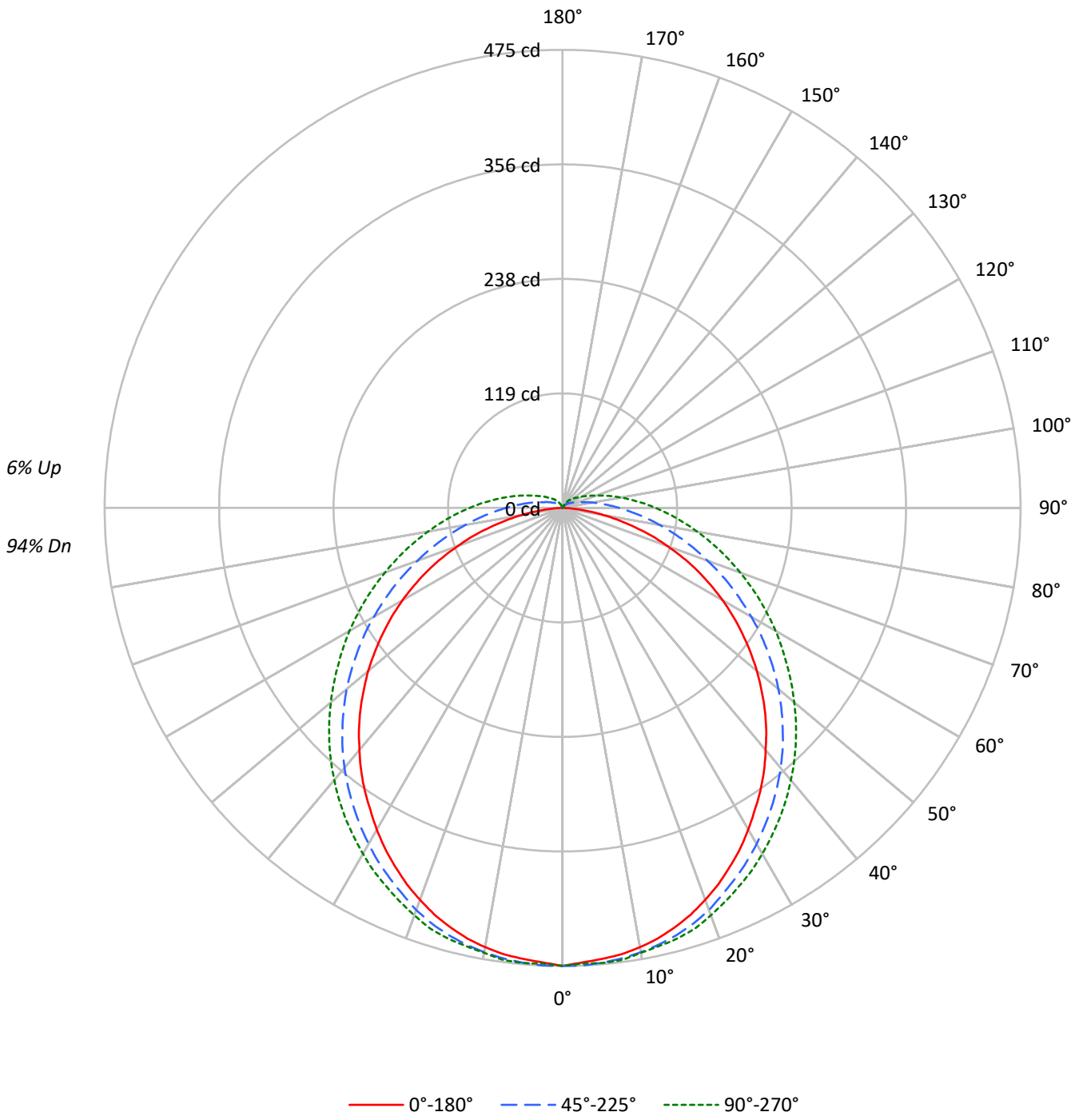
| | |
|---|---|
| Test Method: | LM-79-2019 |
| Report Number: | P1357073 |
| | TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-2511-597-6) |
| Test Lab: | INNOVATION CENTER |
| Issue Date: | 2/17/2026 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS |
| Product Line: | FAIL-SAFE |
| Catalog Number: | 3ASL4-5-1-50-UNV |
| Description: | 3FT 500 LUMEN PER FOOT 4ASL LED LUMINAIRE WITH OPL LENS AND 5000K LEDS 1 ROW |
| Light Source: | - |
| Ballast/Driver: | - |

**Summary**

| | |
|---|---|
| Lumens per Lamp: | N/A |
| Luminaire Lumens: | 1590.0 lumens |
| Efficiency: | N/A |
| Efficacy: | 123.3 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: P1357073
CATALOG NUMBER: 3ASL4-5-1-50-UNV

## Luminous Intensity Polar Plot



TEST NUMBER: P1357073
CATALOG NUMBER: 3ASL4-5-1-50-UNV

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

| RF | 20 | | | | 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 | 0 |
| 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° | 5148 | 5148 | 5148 |
| 5° | 5093 | 5041 | 5018 |
| 10° | 5060 | 4936 | 4887 |
| 15° | 5005 | 4825 | 4784 |
| 20° | 4926 | 4699 | 4658 |
| 25° | 4831 | 4549 | 4520 |
| 30° | 4726 | 4411 | 4392 |
| 35° | 4621 | 4270 | 4263 |
| 40° | 4505 | 4128 | 4131 |
| 45° | 4393 | 3973 | 3997 |
| 50° | 4261 | 3813 | 3854 |
| 55° | 4100 | 3630 | 3713 |
| 60° | 3921 | 3440 | 3589 |
| 65° | 3691 | 3240 | 3464 |
| 70° | 3340 | 3029 | 3344 |
| 75° | 2886 | 2840 | 3252 |
| 80° | 2266 | 2676 | 3193 |
| 85° | 1288 | 2560 | 3215 |

**MAXIMUM LUMINANCE 45°-90°:**

Horizontal Angle: 0°
Vertical Angle: 45°
Luminance: 4393 cd/sqm

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Scaled Data Report

TEST NUMBER: P1357073
CATALOG NUMBER: 3ASL4-5-1-50-UNV

**ZONAL LUMENS:**

| Zone | Lumens | % Fixture |
|---|---|---|
| 0°-10° | 45.0 | 2.8 |
| 10°-20° | 129.1 | 8.1 |
| 20°-30° | 195.2 | 12.3 |
| 30°-40° | 235.9 | 14.8 |
| 40°-50° | 248.1 | 15.6 |
| 50°-60° | 231.1 | 14.5 |
| 60°-70° | 189.9 | 11.9 |
| 70°-80° | 134.8 | 8.5 |
| 80°-90° | 81.2 | 5.1 |
| 90°-100° | 45.5 | 2.9 |
| 100°-110° | 25.2 | 1.6 |
| 110°-120° | 14.0 | 0.9 |
| 120°-130° | 8.1 | 0.5 |
| 130°-140° | 4.4 | 0.3 |
| 140°-150° | 2.0 | 0.1 |
| 150°-160° | 0.4 | 0.0 |
| 160°-170° | 0.0 | 0.0 |
| 170°-180° | 0.0 | 0.0 |
| 0°-30° | 369.3 | 23.2 |
| 0°-40° | 605.2 | 38.1 |
| 0°-60° | 1084.4 | 68.2 |
| 0°-90° | 1490.3 | 93.7 |
| 90°-120° | 84.8 | 5.3 |
| 90°-150° | 99.2 | 6.2 |
| 90°-180° | 100.0 | 6.3 |
| 0°-180° | 1590.0 | 100.0 |

**CANDELA DISTRIBUTION:**

| | 0° | 22.5° | 45° | 67.5° | 90° | Flux |
|---|---|---|---|---|---|---|
| 0° | 475 | 475 | 475 | 475 | 475 | |
| 5° | 470 | 474 | 473 | 473 | 474 | 45 |
| 15° | 450 | 456 | 458 | 460 | 462 | 127 |
| 25° | 410 | 418 | 424 | 430 | 433 | 189 |
| 35° | 358 | 367 | 378 | 388 | 393 | 224 |
| 45° | 297 | 307 | 323 | 336 | 342 | 229 |
| 55° | 228 | 241 | 260 | 277 | 284 | 204 |
| 65° | 155 | 169 | 193 | 215 | 226 | 153 |
| 75° | 78 | 98 | 130 | 157 | 168 | 83 |
| 85° | 14 | 42 | 78 | 107 | 118 | 18 |
| 90° | 0 | 25 | 59 | 86 | 96 | 1 |
| 95° | 0 | 14 | 43 | 68 | 77 | 0 |
| 105° | 0 | 5 | 23 | 41 | 48 | 0 |
| 115° | 0 | 3 | 14 | 25 | 30 | 0 |
| 125° | 0 | 2 | 9 | 16 | 19 | 0 |
| 135° | 0 | 0 | 5 | 10 | 13 | 0 |
| 145° | 0 | 0 | 2 | 6 | 8 | 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 | |

TEST NUMBER: P1357073
CATALOG NUMBER: 3ASL4-5-1-50-UNV

**CANDELA DISTRIBUTION (FULL):**

| | 0° | 22.5° | 45° | 67.5° | 90° |
|---|---|---|---|---|---|
| 0° | 474.9 | *474.9* | 474.9 | 474.9 | 474.9 |
| 2.5° | *471.7* | *476.0* | *474.9* | *472.8* | *472.8* |
| 5° | 469.5 | *473.8* | 473.3 | 472.8 | 473.8 |
| 7.5° | 466.9 | *471.2* | 471.2 | 471.7 | 472.8 |
| 10° | 462.6 | *467.9* | 467.9 | 467.9 | 468.5 |
| 12.5° | 457.2 | *462.6* | 463.6 | 464.2 | 465.2 |
| 15° | 450.2 | *456.1* | 458.3 | 460.4 | 462.0 |
| 17.5° | 442.1 | *448.1* | 451.8 | 454.5 | 457.2 |
| 20° | 432.5 | *438.9* | 443.8 | 447.0 | 449.7 |
| 22.5° | 422.3 | *428.7* | 433.6 | 438.4 | 441.6 |
| 25° | 410.5 | *418.0* | 423.9 | 429.8 | 433.0 |
| 27.5° | 398.6 | *406.2* | 413.7 | 420.7 | 424.4 |
| 30° | 385.2 | *393.8* | 402.4 | 410.5 | 414.2 |
| 32.5° | 371.2 | *380.4* | 390.6 | 399.2 | 403.5 |
| 35° | 357.8 | *366.9* | 378.2 | 387.9 | 392.7 |
| 37.5° | 343.3 | *352.4* | 365.3 | 376.1 | 380.9 |
| 40° | 327.7 | *337.9* | 351.9 | 363.2 | 368.5 |
| 42.5° | 312.7 | *322.9* | 337.9 | 350.3 | 355.7 |
| 45° | 296.6 | *307.3* | 322.9 | 336.3 | 342.2 |
| 47.5° | 279.9 | *291.2* | 307.8 | 321.8 | 328.3 |
| 50° | 263.2 | *275.1* | 292.3 | 307.3 | 313.7 |
| 52.5° | 245.5 | *257.9* | 276.1 | 292.3 | 299.2 |
| 55° | 227.8 | *240.7* | 259.5 | 276.7 | 284.2 |
| 57.5° | 210.1 | *223.0* | 243.4 | 261.6 | 269.7 |
| 60° | 191.8 | *205.2* | 226.2 | 246.1 | 255.2 |
| 62.5° | 173.0 | *187.0* | 209.0 | 230.5 | 240.1 |
| 65° | 154.7 | *168.7* | 192.9 | 215.4 | 225.6 |
| 67.5° | 135.4 | *150.4* | 176.2 | 199.9 | 210.6 |
| 70° | 115.5 | *132.7* | 160.1 | 185.3 | 196.1 |
| 72.5° | 97.8 | *115.5* | 145.1 | 170.8 | 182.1 |
| 75° | 77.9 | *97.8* | 130.0 | 156.9 | 168.2 |
| 77.5° | 60.7 | *82.2* | 116.0 | 143.4 | 154.7 |
| 80° | 43.5 | *67.2* | 102.6 | 130.5 | 141.8 |
| 82.5° | 27.9 | *53.7* | 90.3 | 118.7 | 129.5 |
| 85° | 14.5 | *41.9* | 78.4 | 107.4 | 118.2 |
| 87.5° | 4.3 | *32.2* | 67.7 | 96.2 | 106.9 |
| 90° | 0.0 | *24.7* | 58.6 | 86.0 | 96.2 |
| 92.5° | 0.0 | *18.8* | 50.5 | 76.8 | 87.0 |
| 95° | 0.0 | *14.5* | 43.0 | 67.7 | 77.4 |
| 97.5° | 0.0 | *11.3* | 37.1 | 59.6 | 69.3 |
| 100° | 0.0 | *9.1* | 31.7 | 52.6 | 61.8 |
| 102.5° | 0.0 | *7.5* | 27.4 | 46.7 | 54.8 |
| 105° | 0.0 | *5.4* | 22.6 | 40.8 | 48.4 |
| 107.5° | 0.0 | *3.8* | 19.9 | 36.0 | 42.4 |
| 110° | 0.0 | *3.2* | 17.7 | 31.2 | 37.6 |

TEST NUMBER: P1357073
CATALOG NUMBER: 3ASL4-5-1-50-UNV

**CANDELA DISTRIBUTION (continued):**

| | 0° | 22.5° | 45° | 67.5° | 90° |
|---|---|---|---|---|---|
| 112.5° | 0.0 | *2.7* | 15.6 | 27.9 | 33.3 |
| 115° | 0.0 | *2.7* | 14.0 | 24.7 | 29.5 |
| 117.5° | 0.0 | *2.1* | 11.8 | 22.0 | 26.3 |
| 120° | 0.0 | *2.1* | 10.7 | 19.9 | 23.6 |
| 122.5° | 0.0 | *1.6* | 9.7 | 17.7 | 21.5 |
| 125° | 0.0 | *1.6* | 8.6 | 16.1 | 18.8 |
| 127.5° | 0.0 | *1.1* | 7.5 | 14.5 | 17.2 |
| 130° | 0.0 | *1.1* | 7.0 | 12.9 | 15.6 |
| 132.5° | 0.0 | *0.5* | 6.4 | 11.8 | 14.0 |
| 135° | 0.0 | *0.5* | 5.4 | 10.2 | 12.9 |
| 137.5° | 0.0 | *0.0* | 4.8 | 9.1 | 11.3 |
| 140° | 0.0 | *0.0* | 3.8 | 8.1 | 10.2 |
| 142.5° | 0.5 | *0.0* | 3.2 | 7.0 | 8.6 |
| 145° | 0.5 | *0.0* | 2.1 | 5.9 | 7.5 |
| 147.5° | 0.5 | *0.5* | 1.6 | 4.8 | 5.9 |
| 150° | 0.5 | *0.5* | 1.1 | 3.2 | 4.8 |
| 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: P1357073
CATALOG NUMBER: 3ASL4-5-1-50-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 | 15.09 | 16.64 | 15.55 | 17.08 | 17.55 | 17.04 | 18.59 | 17.50 | 19.04 | 19.50 |
| | 3H | 16.58 | 18.00 | 17.05 | 18.45 | 18.96 | 19.44 | 20.85 | 19.91 | 21.31 | 21.82 |
| | 4H | 17.06 | 18.40 | 17.55 | 18.87 | 19.39 | 20.60 | 21.94 | 21.09 | 22.41 | 22.93 |
| | 6H | 17.33 | 18.58 | 17.84 | 19.07 | 19.60 | 21.79 | 23.03 | 22.29 | 23.52 | 24.06 |
| | 8H | 17.39 | 18.58 | 17.90 | 19.09 | 19.63 | 22.39 | 23.59 | 22.91 | 24.10 | 24.64 |
| | 12H | 17.40 | 18.55 | 17.92 | 19.05 | 19.62 | 23.05 | 24.20 | 23.58 | 24.70 | 25.28 |
| 4H | 2H | 15.95 | 17.29 | 16.44 | 17.76 | 18.28 | 17.48 | 18.82 | 17.97 | 19.29 | 19.81 |
| | 3H | 17.68 | 18.82 | 18.18 | 19.33 | 19.88 | 20.10 | 21.24 | 20.60 | 21.75 | 22.30 |
| | 4H | 18.28 | 19.32 | 18.80 | 19.84 | 20.42 | 21.42 | 22.47 | 21.95 | 22.99 | 23.57 |
| | 6H | 18.67 | 19.59 | 19.22 | 20.15 | 20.74 | 22.80 | 23.72 | 23.35 | 24.28 | 24.87 |
| | 8H | 18.77 | 19.63 | 19.32 | 20.18 | 20.79 | 23.51 | 24.38 | 24.07 | 24.93 | 25.54 |
| | 12H | 18.81 | 19.59 | 19.38 | 20.17 | 20.78 | 24.30 | 25.09 | 24.87 | 25.67 | 26.28 |
| 8H | 4H | 18.92 | 19.79 | 19.47 | 20.34 | 20.94 | 21.64 | 22.50 | 22.19 | 23.06 | 23.66 |
| | 6H | 19.49 | 20.22 | 20.07 | 20.82 | 21.43 | 23.18 | 23.92 | 23.77 | 24.51 | 25.12 |
| | 8H | 19.67 | 20.33 | 20.26 | 20.93 | 21.56 | 24.03 | 24.70 | 24.63 | 25.30 | 25.92 |
| | 12H | 19.77 | 20.37 | 20.37 | 20.96 | 21.65 | 25.00 | 25.59 | 25.60 | 26.18 | 26.88 |
| 12H | 4H | 19.10 | 19.88 | 19.67 | 20.46 | 21.07 | 21.65 | 22.43 | 22.22 | 23.01 | 23.62 |
| | 6H | 19.76 | 20.42 | 20.35 | 21.03 | 21.65 | 23.22 | 23.88 | 23.81 | 24.49 | 25.11 |
| | 8H | 20.03 | 20.62 | 20.63 | 21.21 | 21.90 | 24.14 | 24.73 | 24.73 | 25.32 | 26.01 |

Cooper Lighting Solutions Photometric Lab
1121 Highway 74 South
Peachtree City, GA 30269

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

Report Prepared for

Cooper Lighting Solutions

Fail-Safe

Report Number: SP1-2511-597-5

Test Date: 11/18/2025

Luminaire Tested: 4ASL-2-50-UNV-OPL-1_600mA

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

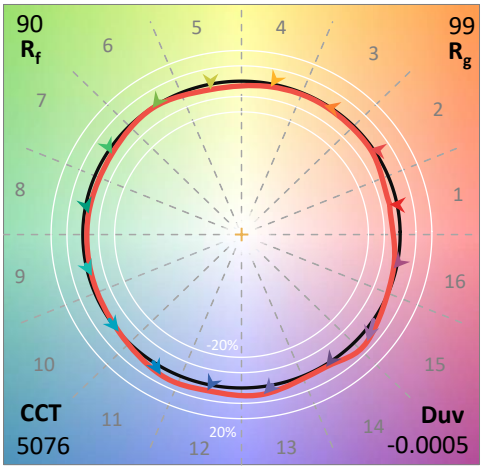
Report Generated By FNC07603 / LDUCLS01DT446
Version: v7.05

## Test Information

| | |
|---|---|
| Test Method: | LM-79-2019 |
| Report Number: | SP1-2511-597-5 |
| Test Lab: | COOPER LIGHTING SOLUTIONS |
| Photometer: | SP1 - 76IN SPHERE |
| Measurement Geometry: | 4π |
| Issue Date: | 11/18/2025 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS |
| Product Line: | Fail-Safe |
| Catalog Number: | **4ASL-2-50-UNV-OPL-1_600mA** |
| Description: | 2foot 4ASL LED LUMINAIRE WITH OPL LENS AND 5000K LEDS with 1 rows at 600mA |

## Spectral Parameters

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CCT (K): | 5076 | CRI (Ra): | | 94.9 | | | |
| CIE u': | 0.2110 | R1: | | 96.7 | R9: | | 74.0 |
| CIE v': | 0.4830 | R2: | | 98.2 | R10: | | 93.9 |
| Duv: | -0.0005 | R3: | | 96.6 | R11: | | 96.2 |
| CIE x: | 0.3429 | R4: | | 95.6 | R12: | | 72.4 |
| CIE y: | 0.3489 | R5: | | 95.1 | R13: | | 98.1 |
| CIE z: | 0.3082 | R6: | | 93.6 | R14: | | 97.8 |
| Peak Wavelength (nm): | 630 | R7: | | 94.0 | R15: | | 95.6 |
| Dominant Wavelength (nm): | 572 | R8: | | 89.6 | | | |
| Purity: | 7.553016 | | | | | | |
| Rf: | 90.4 | | | | | | |
| Rg: | 99 | | | | | | |



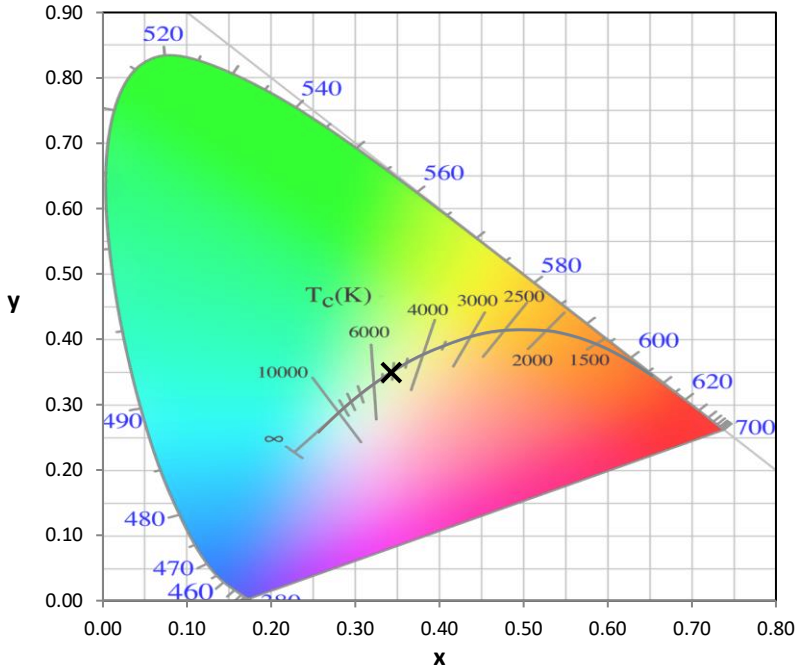

## Test Conditions

| | |
|---|---|
| Stabilization Time: | 24M |
| Operation Time: | 1H 24M |
| Sphere Temperature (°C): | 24.1 |

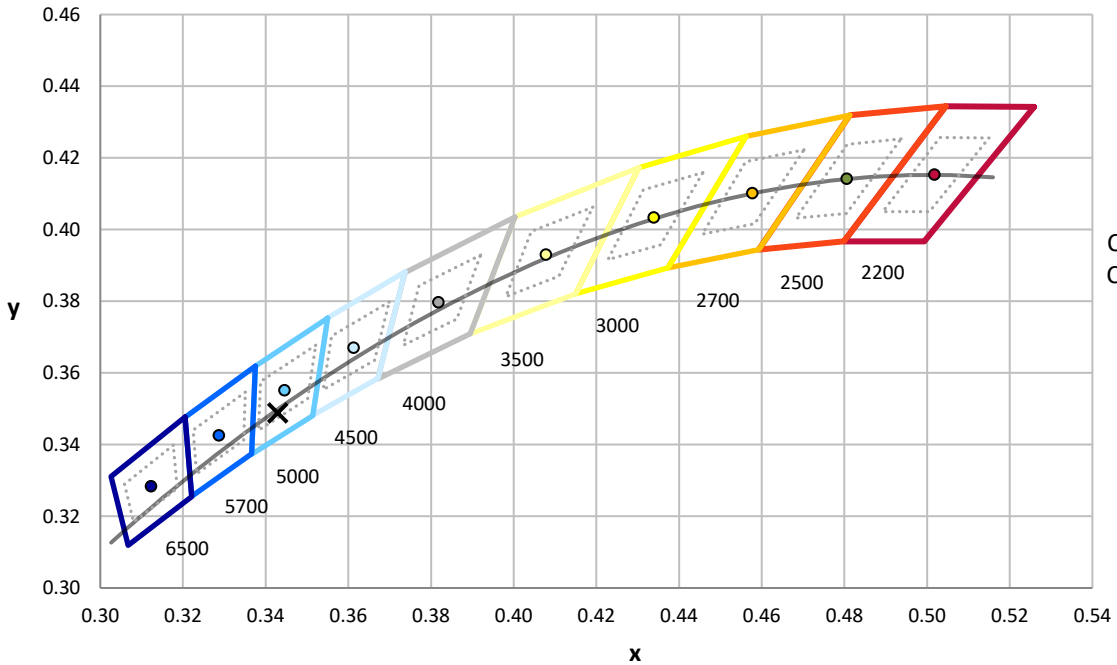
| Measurement and Test Equipment | | | |
|---|---|---|---|
| Instrument | Identification Number | Calibration Date | Calibration Due Date |
| Photometer | 76INCH SPHERE IN0058 | 6/16/2025 | 12/16/2025 |
| Power Meter | XITRON INXT2011004 | 10/21/2025 | 10/21/2026 |
| AC Power Source | CHROMA 61603 IN0063 | 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: SP1-2511-597-5

## CIE 1931 Chromaticity Diagram




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

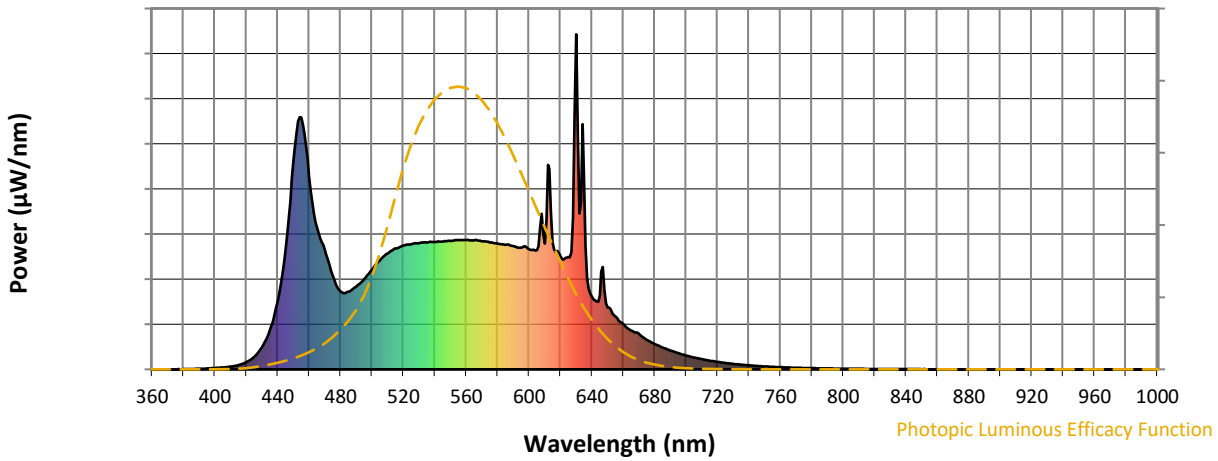



CCT = 5076K
CIE x = 0.3429
CIE y = 0.3489
Duv = -0.0005

Point lies inside the ANSI 5000K 4-step quadrangle

REPORT NUMBER: SP1-2511-597-5

## Photopic Flux vs. Wavelength

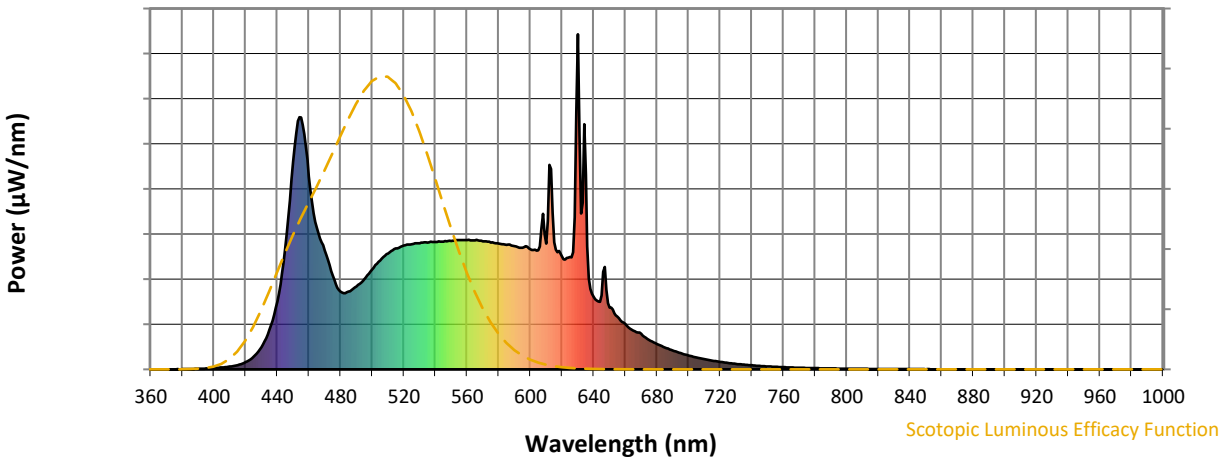



## Photopic Lumens: NR

| λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | NR | 490 | 248 | NR | 620 | 337 | NR | 750 | 9 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 269 | NR | 625 | 335 | NR | 755 | 8 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 298 | NR | 630 | 1000 | NR | 760 | 6 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 325 | NR | 635 | 580 | NR | 765 | 6 | NR | 895 | 0 | NR |
| 380 | 1 | NR | 510 | 346 | NR | 640 | 216 | NR | 770 | 5 | NR | 900 | 0 | NR |
| 385 | 1 | NR | 515 | 361 | NR | 645 | 221 | NR | 775 | 4 | NR | 905 | 0 | NR |
| 390 | 2 | NR | 520 | 369 | NR | 650 | 185 | NR | 780 | 4 | NR | 910 | 0 | NR |
| 395 | 3 | NR | 525 | 374 | NR | 655 | 158 | NR | 785 | 3 | NR | 915 | 0 | NR |
| 400 | 4 | NR | 530 | 376 | NR | 660 | 136 | NR | 790 | 3 | NR | 920 | 0 | NR |
| 405 | 6 | NR | 535 | 379 | NR | 665 | 116 | NR | 795 | 2 | NR | 925 | 0 | NR |
| 410 | 8 | NR | 540 | 381 | NR | 670 | 106 | NR | 800 | 2 | NR | 930 | 0 | NR |
| 415 | 13 | NR | 545 | 381 | NR | 675 | 88 | NR | 805 | 2 | NR | 935 | 0 | NR |
| 420 | 22 | NR | 550 | 383 | NR | 680 | 76 | NR | 810 | 2 | NR | 940 | 0 | NR |
| 425 | 37 | NR | 555 | 386 | NR | 685 | 65 | NR | 815 | 1 | NR | 945 | 0 | NR |
| 430 | 66 | NR | 560 | 386 | NR | 690 | 56 | NR | 820 | 1 | NR | 950 | 0 | NR |
| 435 | 119 | NR | 565 | 385 | NR | 695 | 48 | NR | 825 | 1 | NR | 955 | 0 | NR |
| 440 | 203 | NR | 570 | 382 | NR | 700 | 41 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 359 | NR | 575 | 379 | NR | 705 | 35 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 620 | NR | 580 | 376 | NR | 710 | 30 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 752 | NR | 585 | 372 | NR | 715 | 26 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 576 | NR | 590 | 368 | NR | 720 | 22 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 423 | NR | 595 | 363 | NR | 725 | 19 | NR | 855 | 0 | NR | 985 | 0 | NR |
| 470 | 354 | NR | 600 | 358 | NR | 730 | 16 | NR | 860 | 0 | NR | 990 | 0 | NR |
| 475 | 280 | NR | 605 | 355 | NR | 735 | 14 | NR | 865 | 0 | NR | 995 | 0 | NR |
| 480 | 232 | NR | 610 | 375 | NR | 740 | 12 | NR | 870 | 0 | NR | 1000 | 0 | NR |
| 485 | 232 | NR | 615 | 379 | NR | 745 | 10 | NR | 875 | 0 | NR | | | |

REPORT NUMBER: SP1-2511-597-5

## Scotopic Flux vs. Wavelength

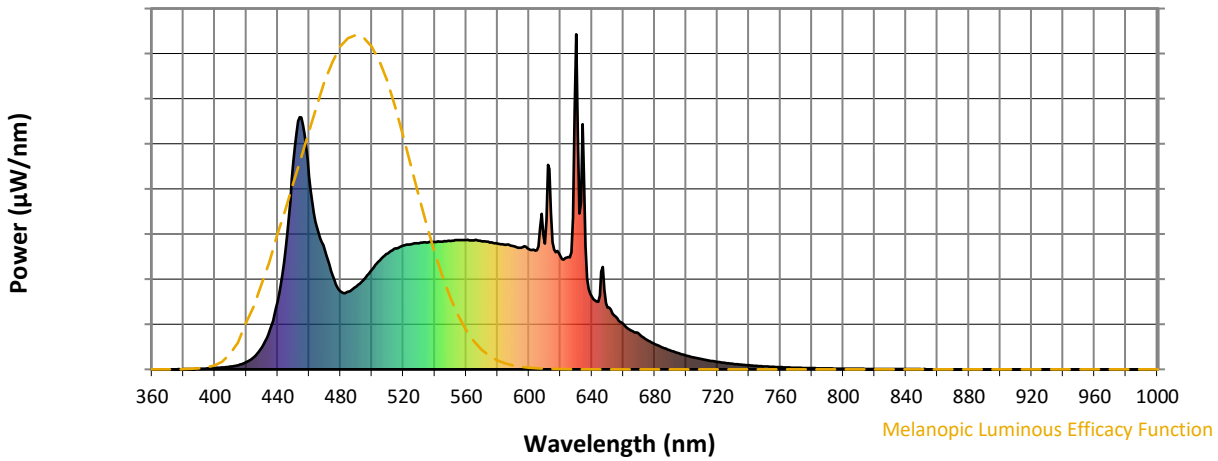



**Scotopic Lumens: NR** **S/P: 2.12**

| λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | NR | 490 | 248 | NR | 620 | 337 | NR | 750 | 9 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 269 | NR | 625 | 335 | NR | 755 | 8 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 298 | NR | 630 | 1000 | NR | 760 | 6 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 325 | NR | 635 | 580 | NR | 765 | 6 | NR | 895 | 0 | NR |
| 380 | 1 | NR | 510 | 346 | NR | 640 | 216 | NR | 770 | 5 | NR | 900 | 0 | NR |
| 385 | 1 | NR | 515 | 361 | NR | 645 | 221 | NR | 775 | 4 | NR | 905 | 0 | NR |
| 390 | 2 | NR | 520 | 369 | NR | 650 | 185 | NR | 780 | 4 | NR | 910 | 0 | NR |
| 395 | 3 | NR | 525 | 374 | NR | 655 | 158 | NR | 785 | 3 | NR | 915 | 0 | NR |
| 400 | 4 | NR | 530 | 376 | NR | 660 | 136 | NR | 790 | 3 | NR | 920 | 0 | NR |
| 405 | 6 | NR | 535 | 379 | NR | 665 | 116 | NR | 795 | 2 | NR | 925 | 0 | NR |
| 410 | 8 | NR | 540 | 381 | NR | 670 | 106 | NR | 800 | 2 | NR | 930 | 0 | NR |
| 415 | 13 | NR | 545 | 381 | NR | 675 | 88 | NR | 805 | 2 | NR | 935 | 0 | NR |
| 420 | 22 | NR | 550 | 383 | NR | 680 | 76 | NR | 810 | 2 | NR | 940 | 0 | NR |
| 425 | 37 | NR | 555 | 386 | NR | 685 | 65 | NR | 815 | 1 | NR | 945 | 0 | NR |
| 430 | 66 | NR | 560 | 386 | NR | 690 | 56 | NR | 820 | 1 | NR | 950 | 0 | NR |
| 435 | 119 | NR | 565 | 385 | NR | 695 | 48 | NR | 825 | 1 | NR | 955 | 0 | NR |
| 440 | 203 | NR | 570 | 382 | NR | 700 | 41 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 359 | NR | 575 | 379 | NR | 705 | 35 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 620 | NR | 580 | 376 | NR | 710 | 30 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 752 | NR | 585 | 372 | NR | 715 | 26 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 576 | NR | 590 | 368 | NR | 720 | 22 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 423 | NR | 595 | 363 | NR | 725 | 19 | NR | 855 | 0 | NR | 985 | 0 | NR |
| 470 | 354 | NR | 600 | 358 | NR | 730 | 16 | NR | 860 | 0 | NR | 990 | 0 | NR |
| 475 | 280 | NR | 605 | 355 | NR | 735 | 14 | NR | 865 | 0 | NR | 995 | 0 | NR |
| 480 | 232 | NR | 610 | 375 | NR | 740 | 12 | NR | 870 | 0 | NR | 1000 | 0 | NR |
| 485 | 232 | NR | 615 | 379 | NR | 745 | 10 | NR | 875 | 0 | NR | | | |

REPORT NUMBER: SP1-2511-597-5

## Melanopic Flux vs. Wavelength




**Melanopic Lumens: NR** **M/P: 4.65**

| λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | NR | 490 | 248 | NR | 620 | 337 | NR | 750 | 9 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 269 | NR | 625 | 335 | NR | 755 | 8 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 298 | NR | 630 | 1000 | NR | 760 | 6 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 325 | NR | 635 | 580 | NR | 765 | 6 | NR | 895 | 0 | NR |
| 380 | 1 | NR | 510 | 346 | NR | 640 | 216 | NR | 770 | 5 | NR | 900 | 0 | NR |
| 385 | 1 | NR | 515 | 361 | NR | 645 | 221 | NR | 775 | 4 | NR | 905 | 0 | NR |
| 390 | 2 | NR | 520 | 369 | NR | 650 | 185 | NR | 780 | 4 | NR | 910 | 0 | NR |
| 395 | 3 | NR | 525 | 374 | NR | 655 | 158 | NR | 785 | 3 | NR | 915 | 0 | NR |
| 400 | 4 | NR | 530 | 376 | NR | 660 | 136 | NR | 790 | 3 | NR | 920 | 0 | NR |
| 405 | 6 | NR | 535 | 379 | NR | 665 | 116 | NR | 795 | 2 | NR | 925 | 0 | NR |
| 410 | 8 | NR | 540 | 381 | NR | 670 | 106 | NR | 800 | 2 | NR | 930 | 0 | NR |
| 415 | 13 | NR | 545 | 381 | NR | 675 | 88 | NR | 805 | 2 | NR | 935 | 0 | NR |
| 420 | 22 | NR | 550 | 383 | NR | 680 | 76 | NR | 810 | 2 | NR | 940 | 0 | NR |
| 425 | 37 | NR | 555 | 386 | NR | 685 | 65 | NR | 815 | 1 | NR | 945 | 0 | NR |
| 430 | 66 | NR | 560 | 386 | NR | 690 | 56 | NR | 820 | 1 | NR | 950 | 0 | NR |
| 435 | 119 | NR | 565 | 385 | NR | 695 | 48 | NR | 825 | 1 | NR | 955 | 0 | NR |
| 440 | 203 | NR | 570 | 382 | NR | 700 | 41 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 359 | NR | 575 | 379 | NR | 705 | 35 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 620 | NR | 580 | 376 | NR | 710 | 30 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 752 | NR | 585 | 372 | NR | 715 | 26 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 576 | NR | 590 | 368 | NR | 720 | 22 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 423 | NR | 595 | 363 | NR | 725 | 19 | NR | 855 | 0 | NR | 985 | 0 | NR |
| 470 | 354 | NR | 600 | 358 | NR | 730 | 16 | NR | 860 | 0 | NR | 990 | 0 | NR |
| 475 | 280 | NR | 605 | 355 | NR | 735 | 14 | NR | 865 | 0 | NR | 995 | 0 | NR |
| 480 | 232 | NR | 610 | 375 | NR | 740 | 12 | NR | 870 | 0 | NR | 1000 | 0 | NR |
| 485 | 232 | NR | 615 | 379 | NR | 745 | 10 | NR | 875 | 0 | NR | | | |

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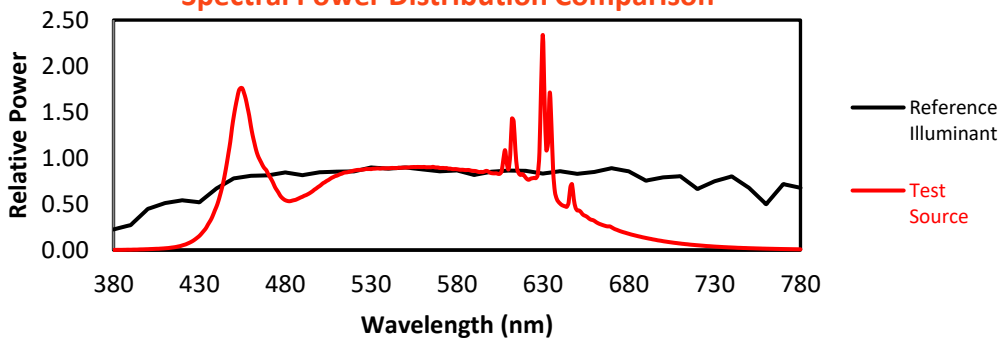
# TM-30-18

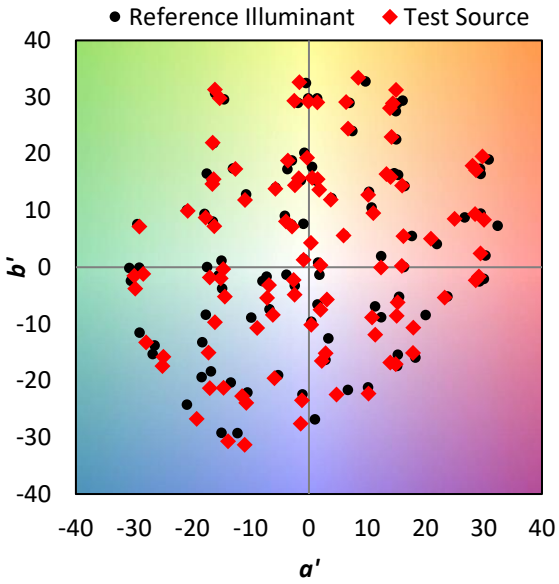
## Summary

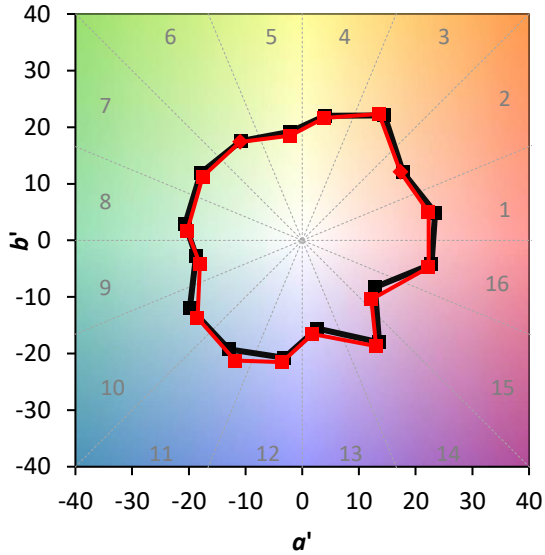
$R_f$ = 90.4
$R_g$ = 99
CIE $R_a$ = 94.9
$R_9$ = 74.0

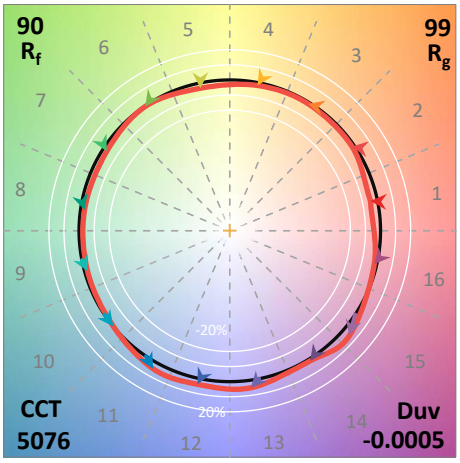
## Spectral Power Distribution Comparison

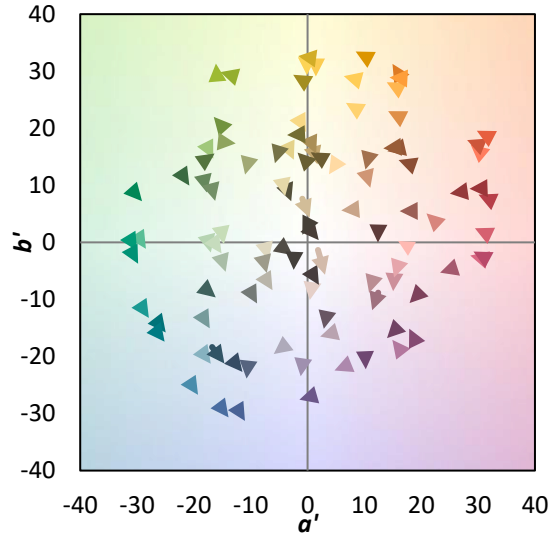



## Color Vector Graphics



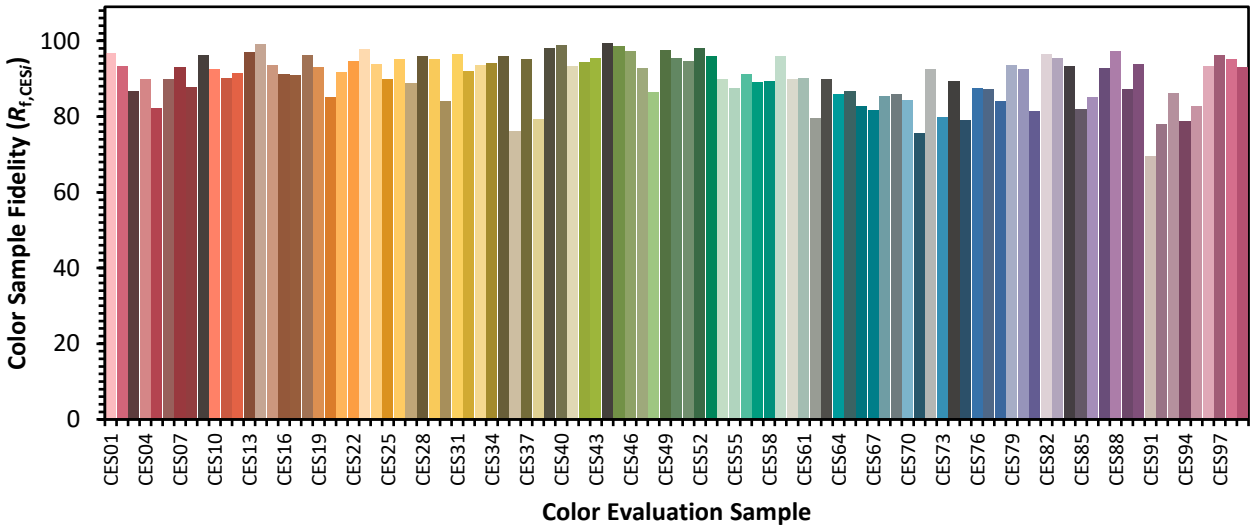



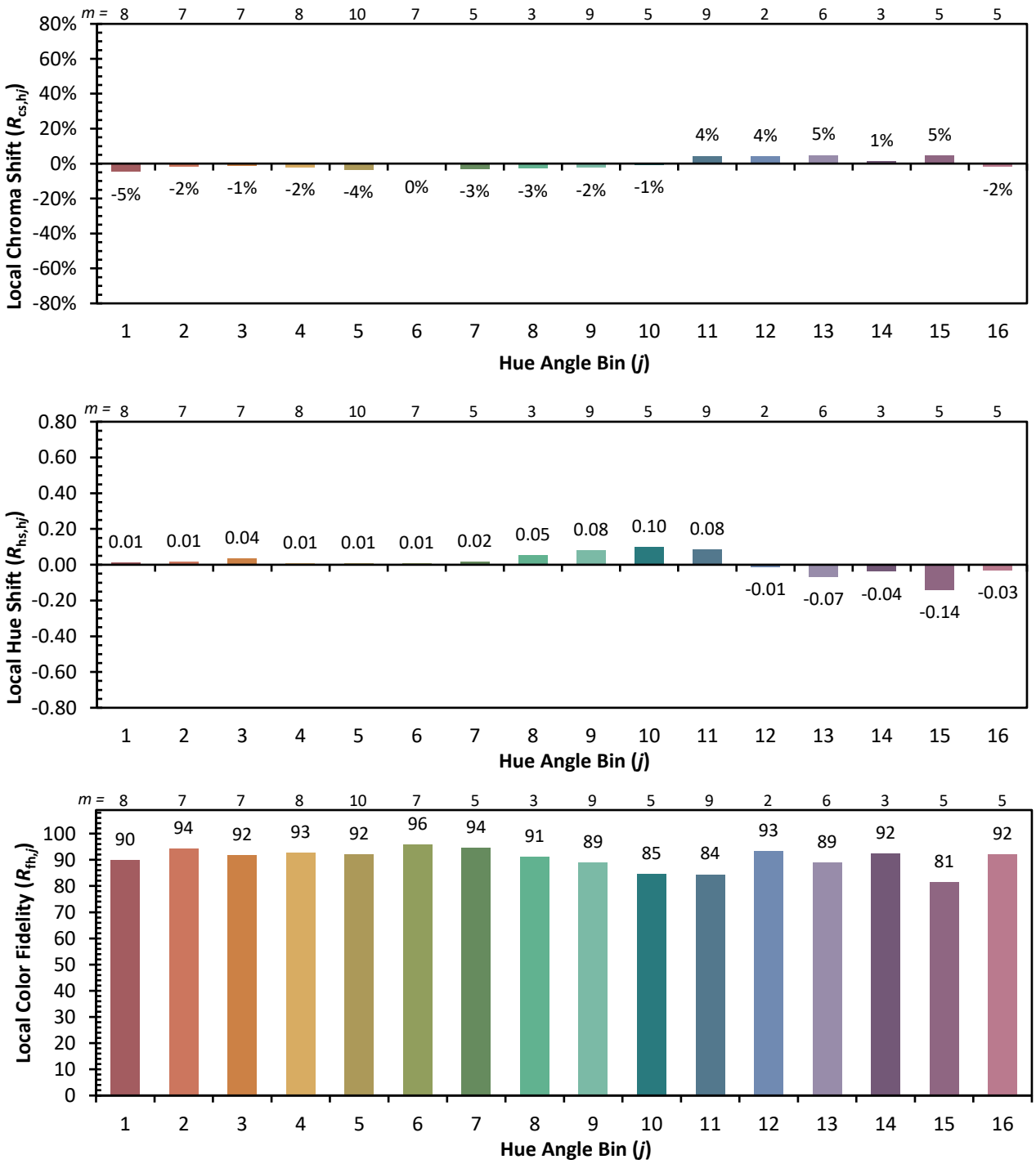



**Individual Sample Fidelity Index ($R_{f,i}$)**

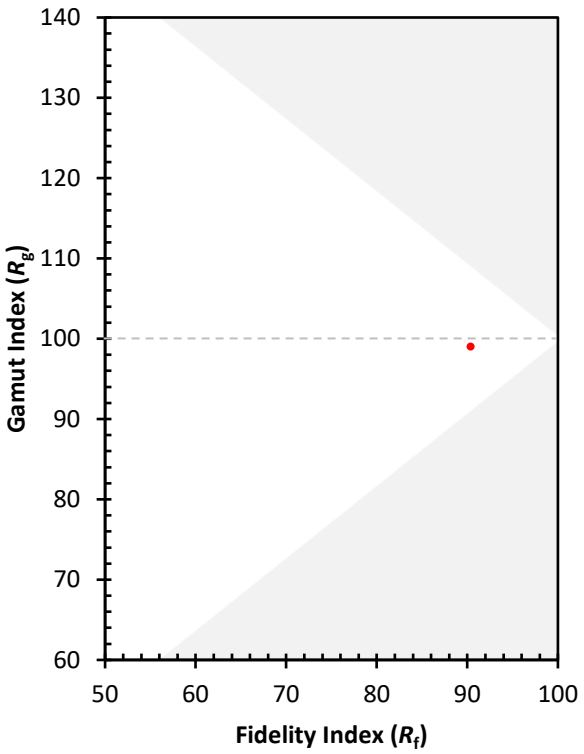
| | | | |
|---|---|---|---|
| CES01 = 85 | CES26 = 95 | CES51 = 95 | CES76 = 87 |
| CES02 = 61 | CES27 = 89 | CES52 = 98 | CES77 = 87 |
| CES03 = 31 | CES28 = 96 | CES53 = 96 | CES78 = 84 |
| CES04 = 69 | CES29 = 95 | CES54 = 90 | CES79 = 94 |
| CES05 = 48 | CES30 = 84 | CES55 = 88 | CES80 = 93 |
| CES06 = 50 | CES31 = 96 | CES56 = 91 | CES81 = 81 |
| CES07 = 41 | CES32 = 92 | CES57 = 89 | CES82 = 97 |
| CES08 = 40 | CES33 = 94 | CES58 = 89 | CES83 = 95 |
| CES09 = 29 | CES34 = 94 | CES59 = 96 | CES84 = 93 |
| CES10 = 73 | CES35 = 96 | CES60 = 90 | CES85 = 82 |
| CES11 = 56 | CES36 = 76 | CES61 = 90 | CES86 = 85 |
| CES12 = 62 | CES37 = 95 | CES62 = 80 | CES87 = 93 |
| CES13 = 42 | CES38 = 79 | CES63 = 90 | CES88 = 97 |
| CES14 = 74 | CES39 = 98 | CES64 = 86 | CES89 = 87 |
| CES15 = 71 | CES40 = 99 | CES65 = 87 | CES90 = 94 |
| CES16 = 47 | CES41 = 93 | CES66 = 83 | CES91 = 70 |
| CES17 = 48 | CES42 = 94 | CES67 = 82 | CES92 = 78 |
| CES18 = 56 | CES43 = 95 | CES68 = 85 | CES93 = 86 |
| CES19 = 70 | CES44 = 99 | CES69 = 86 | CES94 = 79 |
| CES20 = 65 | CES45 = 99 | CES70 = 84 | CES95 = 83 |
| CES21 = 85 | CES46 = 97 | CES71 = 76 | CES96 = 93 |
| CES22 = 77 | CES47 = 93 | CES72 = 92 | CES97 = 96 |
| CES23 = 91 | CES48 = 86 | CES73 = 80 | CES98 = 95 |
| CES24 = 90 | CES49 = 98 | CES74 = 89 | CES99 = 93 |
| CES25 = 70 | CES50 = 96 | CES75 = 79 | |

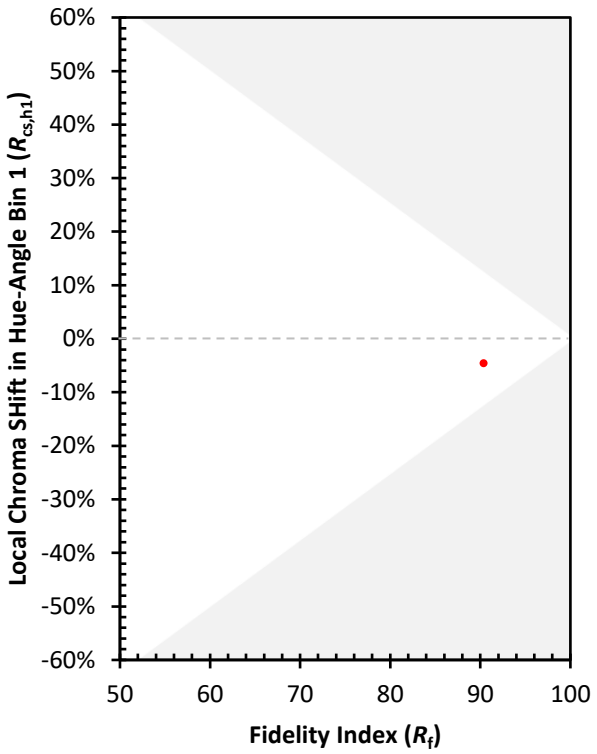


## Color Rendition by Hue-Angle Bin



## Measure Comparisons




(END OF REPORT)