

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: P1357172

Luminaire Tested: 4ASL4-20HE-2-30-UNV

Issue Date: 2/17/2026

Test Information

Test Method: LM-79-2019
Report Number: P1357172
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-2511-597-7)
Test Lab: INNOVATION CENTER
Issue Date: 2/17/2026
Manufacturer: COOPER LIGHTING SOLUTIONS
Product Line: FAIL-SAFE
Catalog Number: 4ASL4-20HE-2-30-UNV
Description: 4FT 2000 LUMEN PER FOOT 4ASL LED LUMINAIRE WITH OPL LENS AND 3000K LEDS 2 ROW
Light Source: -
Ballast/Driver: -

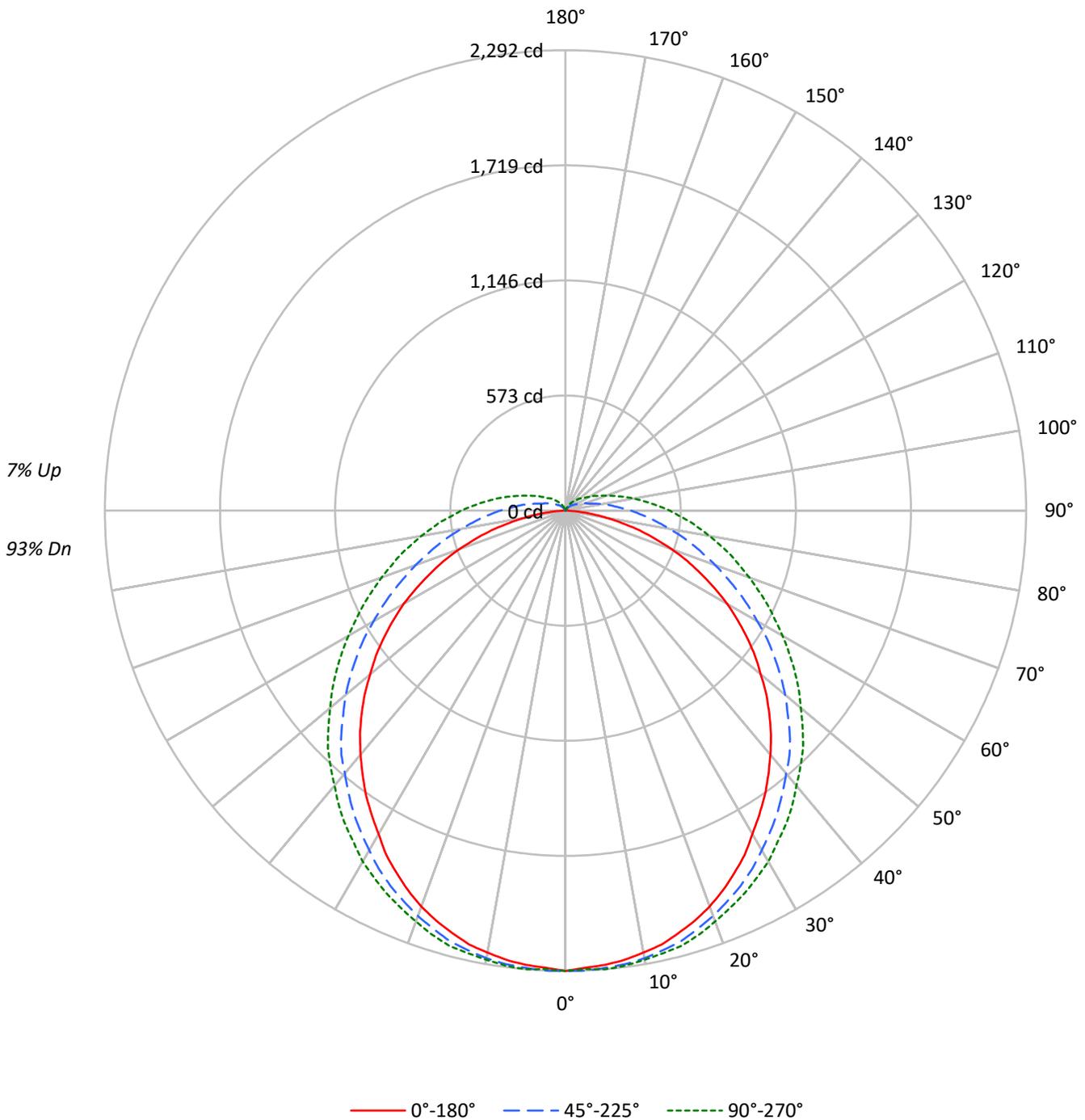
Summary

Lumens per Lamp: N/A
Luminaire Lumens: 7868.0 lumens
Efficiency: N/A
Efficacy: 109.9 lumens/watt
Spacing Criteria (0/90/45): 1.21 / 1.3 / 1.4
Luminous Opening: Rectangular w/ Sides (W: 0.33' x L: 3.98' x H: 0.1')
CIE Type: Direct

Input Watts (W): 71.6
Input Voltage (V): NR
Input Current (A_{in}): 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: P1357172
CATALOG NUMBER: 4ASL4-20HE-2-30-UNV

Luminous Intensity Polar Plot





TEST NUMBER: P1357172

CATALOG NUMBER: 4ASL4-20HE-2-30-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 | 0 |
| RCR | | | | | | | | | | | | | | | | | | | | | |
| 0 | 117 | 117 | 117 | 117 | 114 | 114 | 114 | 114 | 107 | 107 | 107 | 101 | 101 | 101 | 95 | 95 | 95 | 95 | 95 | 95 | 93 |
| 1 | 105 | 100 | 95 | 90 | 102 | 97 | 92 | 88 | 91 | 87 | 84 | 86 | 83 | 80 | 81 | 79 | 77 | 77 | 77 | 77 | 74 |
| 2 | 95 | 86 | 79 | 72 | 92 | 84 | 77 | 71 | 79 | 73 | 68 | 74 | 70 | 65 | 70 | 66 | 63 | 63 | 63 | 63 | 60 |
| 3 | 86 | 75 | 66 | 59 | 83 | 73 | 65 | 58 | 69 | 62 | 56 | 65 | 59 | 55 | 62 | 57 | 53 | 53 | 53 | 53 | 50 |
| 4 | 79 | 66 | 57 | 50 | 76 | 64 | 56 | 49 | 61 | 54 | 48 | 58 | 51 | 46 | 55 | 49 | 45 | 45 | 45 | 45 | 42 |
| 5 | 72 | 59 | 50 | 43 | 70 | 57 | 49 | 42 | 54 | 47 | 41 | 52 | 45 | 40 | 49 | 43 | 39 | 39 | 39 | 39 | 36 |
| 6 | 67 | 53 | 44 | 37 | 64 | 52 | 43 | 37 | 49 | 41 | 36 | 47 | 40 | 35 | 44 | 39 | 34 | 34 | 34 | 34 | 32 |
| 7 | 62 | 48 | 39 | 33 | 60 | 47 | 38 | 32 | 45 | 37 | 32 | 43 | 36 | 31 | 41 | 35 | 30 | 30 | 30 | 30 | 28 |
| 8 | 58 | 44 | 35 | 29 | 56 | 43 | 34 | 29 | 41 | 33 | 28 | 39 | 32 | 28 | 37 | 31 | 27 | 27 | 27 | 27 | 25 |
| 9 | 54 | 40 | 32 | 26 | 52 | 39 | 31 | 26 | 37 | 30 | 25 | 36 | 29 | 25 | 34 | 29 | 24 | 24 | 24 | 24 | 22 |
| 10 | 50 | 37 | 29 | 24 | 49 | 36 | 28 | 23 | 35 | 28 | 23 | 33 | 27 | 22 | 32 | 26 | 22 | 22 | 22 | 22 | 20 |

AVERAGE LUMINANCE (cd/sqm):

| | 0° | 45° | 90° |
|-----|-------|-------|-------|
| 0° | 18599 | 18599 | 18599 |
| 5° | 18451 | 18230 | 18174 |
| 10° | 18326 | 17893 | 17731 |
| 15° | 18159 | 17525 | 17376 |
| 20° | 17942 | 17061 | 16878 |
| 25° | 17597 | 16602 | 16447 |
| 30° | 17164 | 16079 | 16020 |
| 35° | 16828 | 15592 | 15524 |
| 40° | 16436 | 15067 | 15002 |
| 45° | 16040 | 14615 | 14621 |
| 50° | 15530 | 14016 | 14055 |
| 55° | 15039 | 13373 | 13608 |
| 60° | 14435 | 12650 | 13130 |
| 65° | 13496 | 11978 | 12761 |
| 70° | 12445 | 11346 | 12422 |
| 75° | 10912 | 10858 | 12309 |
| 80° | 8505 | 10426 | 12271 |
| 85° | 5167 | 10414 | 12623 |

MAXIMUM LUMINANCE 45°-90°:

Horizontal Angle: 0°
 Vertical Angle: 45°
 Luminance: 16040 cd/sqm



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ZONAL LUMENS:

| Zone | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10° | 217.4 | 2.8 |
| 10°-20° | 624.8 | 7.9 |
| 20°-30° | 946.7 | 12.0 |
| 30°-40° | 1145.0 | 14.6 |
| 40°-50° | 1207.1 | 15.3 |
| 50°-60° | 1126.6 | 14.3 |
| 60°-70° | 930.1 | 11.8 |
| 70°-80° | 674.8 | 8.6 |
| 80°-90° | 426.3 | 5.4 |
| 90°-100° | 254.5 | 3.2 |
| 100°-110° | 145.9 | 1.9 |
| 110°-120° | 82.8 | 1.1 |
| 120°-130° | 47.3 | 0.6 |
| 130°-140° | 25.6 | 0.3 |
| 140°-150° | 11.2 | 0.1 |
| 150°-160° | 2.0 | 0.0 |
| 160°-170° | 0.0 | 0.0 |
| 170°-180° | 0.0 | 0.0 |
| 0°-30° | 1788.8 | 22.7 |
| 0°-40° | 2933.8 | 37.3 |
| 0°-60° | 5267.5 | 66.9 |
| 0°-90° | 7298.7 | 92.8 |
| 90°-120° | 483.2 | 6.1 |
| 90°-150° | 567.2 | 7.2 |
| 90°-180° | 569.0 | 7.2 |
| 0°-180° | 7868.0 | 100.0 |

CANDELA DISTRIBUTION:

| | 0° | 22.5° | 45° | 67.5° | 90° | Flux |
|------|------|-------|------|-------|------|------|
| 0° | 2292 | 2292 | 2292 | 2292 | 2292 | |
| 5° | 2270 | 2292 | 2285 | 2285 | 2292 | 216 |
| 15° | 2177 | 2205 | 2220 | 2227 | 2241 | 614 |
| 25° | 1989 | 2018 | 2061 | 2090 | 2104 | 916 |
| 35° | 1730 | 1773 | 1838 | 1888 | 1910 | 1081 |
| 45° | 1434 | 1492 | 1578 | 1643 | 1672 | 1106 |
| 55° | 1103 | 1168 | 1268 | 1355 | 1391 | 986 |
| 65° | 742 | 822 | 944 | 1059 | 1110 | 737 |
| 75° | 382 | 483 | 656 | 793 | 850 | 402 |
| 85° | 72 | 223 | 418 | 562 | 620 | 88 |
| 90° | 0 | 137 | 324 | 461 | 519 | 3 |
| 95° | 0 | 86 | 245 | 375 | 425 | 0 |
| 105° | 0 | 29 | 137 | 238 | 274 | 0 |
| 115° | 0 | 14 | 79 | 144 | 173 | 0 |
| 125° | 0 | 7 | 50 | 94 | 108 | 0 |
| 135° | 0 | 0 | 29 | 58 | 72 | 0 |
| 145° | 0 | 0 | 14 | 36 | 43 | 0 |
| 155° | 0 | 0 | 0 | 7 | 14 | 0 |
| 165° | 0 | 0 | 0 | 0 | 0 | 0 |
| 175° | 0 | 0 | 0 | 0 | 0 | 0 |
| 180° | 0 | 0 | 0 | 0 | 0 | 0 |



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 CATALOG NUMBER: 4ASL4-20HE-2-30-UNV

CANDELA DISTRIBUTION (FULL):

| | 0° | 22.5° | 45° | 67.5° | 90° |
|--------|--------|--------|--------|--------|--------|
| 0° | 2291.9 | 2291.9 | 2291.9 | 2291.9 | 2291.9 |
| 2.5° | 2277.5 | 2299.1 | 2291.9 | 2284.7 | 2284.7 |
| 5° | 2270.2 | 2291.9 | 2284.7 | 2284.7 | 2291.9 |
| 7.5° | 2255.8 | 2277.5 | 2277.5 | 2277.5 | 2284.7 |
| 10° | 2234.2 | 2263.0 | 2263.0 | 2263.0 | 2270.2 |
| 12.5° | 2212.6 | 2234.2 | 2241.4 | 2248.6 | 2255.8 |
| 15° | 2176.6 | 2205.4 | 2219.8 | 2227.0 | 2241.4 |
| 17.5° | 2140.5 | 2162.1 | 2183.8 | 2205.4 | 2212.6 |
| 20° | 2097.3 | 2126.1 | 2147.7 | 2169.3 | 2176.6 |
| 22.5° | 2046.8 | 2075.7 | 2104.5 | 2126.1 | 2140.5 |
| 25° | 1989.2 | 2018.0 | 2061.2 | 2090.1 | 2104.5 |
| 27.5° | 1931.5 | 1960.3 | 2010.8 | 2046.8 | 2061.2 |
| 30° | 1859.4 | 1902.7 | 1953.1 | 1996.4 | 2018.0 |
| 32.5° | 1794.6 | 1837.8 | 1895.5 | 1945.9 | 1960.3 |
| 35° | 1729.7 | 1773.0 | 1837.8 | 1888.3 | 1909.9 |
| 37.5° | 1657.6 | 1708.1 | 1773.0 | 1830.6 | 1852.2 |
| 40° | 1585.6 | 1636.0 | 1708.1 | 1773.0 | 1787.4 |
| 42.5° | 1513.5 | 1563.9 | 1650.4 | 1708.1 | 1729.7 |
| 45° | 1434.2 | 1491.9 | 1578.4 | 1643.2 | 1672.1 |
| 47.5° | 1354.9 | 1412.6 | 1499.1 | 1571.2 | 1600.0 |
| 50° | 1268.5 | 1333.3 | 1427.0 | 1499.1 | 1527.9 |
| 52.5° | 1189.2 | 1254.0 | 1347.7 | 1427.0 | 1463.0 |
| 55° | 1102.7 | 1167.6 | 1268.5 | 1354.9 | 1391.0 |
| 57.5° | 1016.2 | 1081.1 | 1189.2 | 1282.9 | 1318.9 |
| 60° | 929.7 | 994.6 | 1102.7 | 1210.8 | 1246.8 |
| 62.5° | 836.0 | 908.1 | 1023.4 | 1131.5 | 1174.8 |
| 65° | 742.3 | 821.6 | 944.1 | 1059.4 | 1109.9 |
| 67.5° | 655.8 | 735.1 | 864.9 | 994.6 | 1037.8 |
| 70° | 562.2 | 648.6 | 792.8 | 922.5 | 973.0 |
| 72.5° | 468.5 | 562.2 | 720.7 | 857.6 | 908.1 |
| 75° | 382.0 | 482.9 | 655.8 | 792.8 | 850.4 |
| 77.5° | 288.3 | 410.8 | 591.0 | 735.1 | 785.6 |
| 80° | 209.0 | 338.7 | 526.1 | 677.5 | 727.9 |
| 82.5° | 136.9 | 273.9 | 468.5 | 619.8 | 670.3 |
| 85° | 72.1 | 223.4 | 418.0 | 562.2 | 619.8 |
| 87.5° | 21.6 | 173.0 | 367.6 | 511.7 | 562.2 |
| 90° | 0.0 | 136.9 | 324.3 | 461.3 | 518.9 |
| 92.5° | 0.0 | 108.1 | 281.1 | 418.0 | 468.5 |
| 95° | 0.0 | 86.5 | 245.0 | 374.8 | 425.2 |
| 97.5° | 0.0 | 72.1 | 216.2 | 338.7 | 382.0 |
| 100° | 0.0 | 57.7 | 187.4 | 302.7 | 345.9 |
| 102.5° | 0.0 | 43.2 | 158.6 | 266.7 | 309.9 |
| 105° | 0.0 | 28.8 | 136.9 | 237.8 | 273.9 |
| 107.5° | 0.0 | 21.6 | 115.3 | 209.0 | 245.0 |
| 110° | 0.0 | 21.6 | 108.1 | 180.2 | 216.2 |



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CANDELA DISTRIBUTION (continued):

| | 0° | 22.5° | 45° | 67.5° | 90° |
|--------|-----|-------|------|-------|-------|
| 112.5° | 0.0 | 14.4 | 93.7 | 165.8 | 194.6 |
| 115° | 0.0 | 14.4 | 79.3 | 144.1 | 173.0 |
| 117.5° | 0.0 | 14.4 | 72.1 | 129.7 | 158.6 |
| 120° | 0.0 | 14.4 | 64.9 | 115.3 | 136.9 |
| 122.5° | 0.0 | 7.2 | 57.7 | 100.9 | 122.5 |
| 125° | 0.0 | 7.2 | 50.4 | 93.7 | 108.1 |
| 127.5° | 0.0 | 7.2 | 43.2 | 86.5 | 100.9 |
| 130° | 0.0 | 7.2 | 43.2 | 79.3 | 93.7 |
| 132.5° | 0.0 | 0.0 | 36.0 | 72.1 | 86.5 |
| 135° | 0.0 | 0.0 | 28.8 | 57.7 | 72.1 |
| 137.5° | 0.0 | 0.0 | 28.8 | 50.4 | 64.9 |
| 140° | 0.0 | 0.0 | 21.6 | 50.4 | 57.7 |
| 142.5° | 0.0 | 0.0 | 14.4 | 43.2 | 50.4 |
| 145° | 0.0 | 0.0 | 14.4 | 36.0 | 43.2 |
| 147.5° | 0.0 | 0.0 | 7.2 | 28.8 | 36.0 |
| 150° | 0.0 | 0.0 | 7.2 | 21.6 | 28.8 |
| 152.5° | 0.0 | 0.0 | 0.0 | 14.4 | 21.6 |
| 155° | 0.0 | 0.0 | 0.0 | 7.2 | 14.4 |
| 157.5° | 0.0 | 0.0 | 0.0 | 0.0 | 7.2 |
| 160° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 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 |



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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 | 19.47 | 21.00 | 19.94 | 21.46 | 21.95 | 21.53 | 23.06 | 22.00 | 23.52 | 24.01 |
| | 3H | 20.97 | 22.37 | 21.46 | 22.84 | 23.37 | 23.98 | 25.38 | 24.46 | 25.85 | 26.38 |
| | 4H | 21.45 | 22.78 | 21.96 | 23.27 | 23.81 | 25.19 | 26.52 | 25.69 | 27.00 | 27.55 |
| | 6H | 21.73 | 22.96 | 22.24 | 23.46 | 24.02 | 26.46 | 27.70 | 26.98 | 28.20 | 28.76 |
| | 8H | 21.78 | 22.96 | 22.31 | 23.49 | 24.06 | 27.12 | 28.30 | 27.65 | 28.83 | 29.39 |
| | 12H | 21.79 | 22.93 | 22.33 | 23.45 | 24.05 | 27.85 | 28.98 | 28.39 | 29.50 | 30.10 |
| 4H | 2H | 20.35 | 21.68 | 20.85 | 22.16 | 22.71 | 21.96 | 23.29 | 22.47 | 23.77 | 24.32 |
| | 3H | 22.09 | 23.22 | 22.61 | 23.75 | 24.32 | 24.64 | 25.77 | 25.16 | 26.30 | 26.87 |
| | 4H | 22.70 | 23.74 | 23.24 | 24.28 | 24.88 | 26.02 | 27.06 | 26.56 | 27.60 | 28.20 |
| | 6H | 23.10 | 24.02 | 23.66 | 24.58 | 25.20 | 27.49 | 28.41 | 28.05 | 28.98 | 29.59 |
| | 8H | 23.20 | 24.06 | 23.76 | 24.63 | 25.25 | 28.26 | 29.12 | 28.82 | 29.69 | 30.31 |
| | 12H | 23.25 | 24.03 | 23.83 | 24.62 | 25.25 | 29.11 | 29.90 | 29.70 | 30.49 | 31.12 |
| 8H | 4H | 23.39 | 24.26 | 23.96 | 24.82 | 25.45 | 26.24 | 27.11 | 26.81 | 27.67 | 28.30 |
| | 6H | 23.98 | 24.71 | 24.58 | 25.32 | 25.95 | 27.89 | 28.62 | 28.48 | 29.23 | 29.86 |
| | 8H | 24.17 | 24.83 | 24.78 | 25.45 | 26.09 | 28.80 | 29.46 | 29.41 | 30.08 | 30.72 |
| | 12H | 24.29 | 24.88 | 24.90 | 25.49 | 26.20 | 29.84 | 30.43 | 30.45 | 31.04 | 31.75 |
| 12H | 4H | 23.59 | 24.38 | 24.18 | 24.97 | 25.60 | 26.25 | 27.04 | 26.84 | 27.63 | 28.26 |
| | 6H | 24.28 | 24.95 | 24.89 | 25.56 | 26.21 | 27.93 | 28.59 | 28.53 | 29.21 | 29.85 |
| | 8H | 24.57 | 25.16 | 25.18 | 25.77 | 26.48 | 28.91 | 29.50 | 29.52 | 30.10 | 30.81 |

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

Report Prepared for

Cooper Lighting Solutions

Fail-Safe

Report Number: SP1-2511-597-3

Test Date: 11/18/2025

Luminaire Tested: 4ASL-2-30-UNV-OPL-1_600mA

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

Test Information

Test Method: LM-79-2019
 Report Number: SP1-2511-597-3
 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-2-30-UNV-OPL-1_600mA**
 Description: 2foot 4ASL LED LUMINAIRE WITH OPL LENS AND 3000K LEDs with 1 rows at 600mA

Spectral Parameters

CCT (K): 3005
 CIE u': 0.2513
 CIE v': 0.5178
 Duv: -0.0025
 CIE x: 0.4330
 CIE y: 0.3966
 CIE z: 0.1704
 Peak Wavelength (nm): 630
 Dominant Wavelength (nm): 583
 Purity: 49.00645
 Rf: 90.1
 Rg: 103.3

CRI (Ra): 93.9
 R1: 96.5
 R2: 96.6
 R3: 95.5
 R4: 94.4
 R5: 96.0
 R6: 96.4
 R7: 91.7
 R8: 84.0
 R9: 62.0
 R10: 90.8
 R11: 94.1
 R12: 88.9
 R13: 96.4
 R14: 96.3
 R15: 91.9



Test Conditions

Stabilization Time: 32M
 Operation Time: 1H 32M
 Sphere Temperature (°C): 24.1

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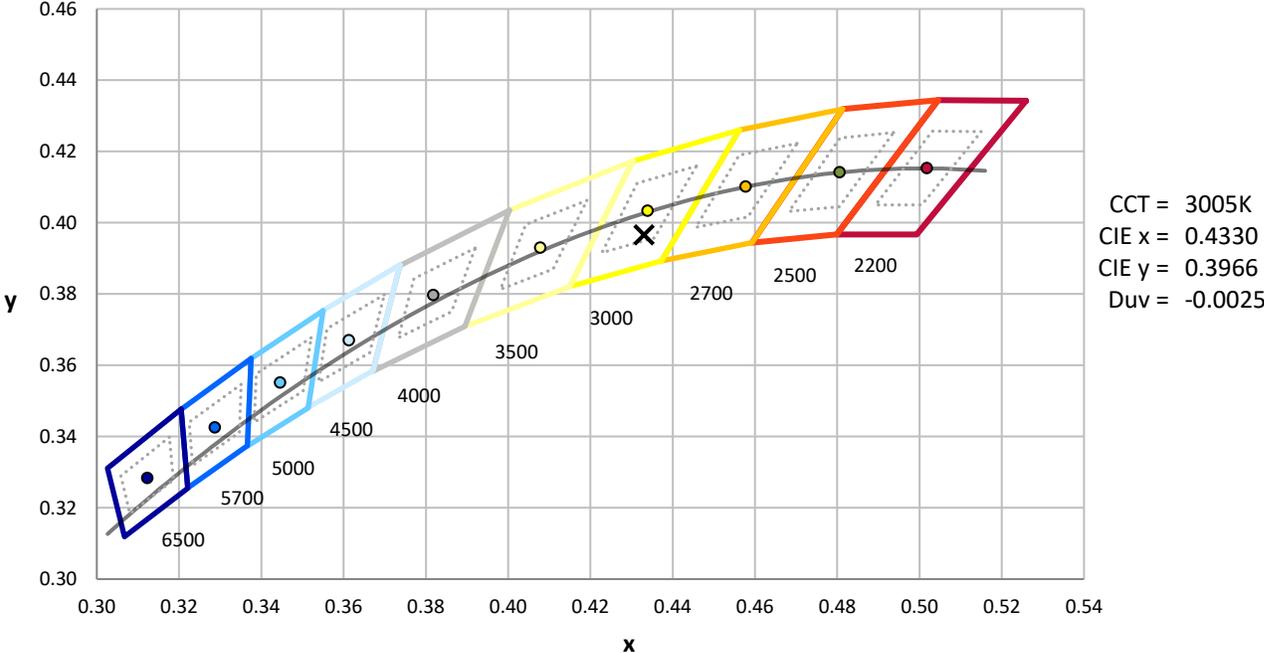
| Measurement and Test Equipment | | | |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument | Identification Number | Calibration Date | Calibration Due Date |
| Photometer | 76INCH SPHERE IN0058 | 6/16/2025 | 12/16/2025 |
| Power Meter | 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 |

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CIE 1931 Chromaticity Diagram



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



CCT = 3005K
 CIE x = 0.4330
 CIE y = 0.3966
 Duv = -0.0025

Point lies inside the ANSI 3000K 4-step quadrangle

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Photopic Flux vs. Wavelength

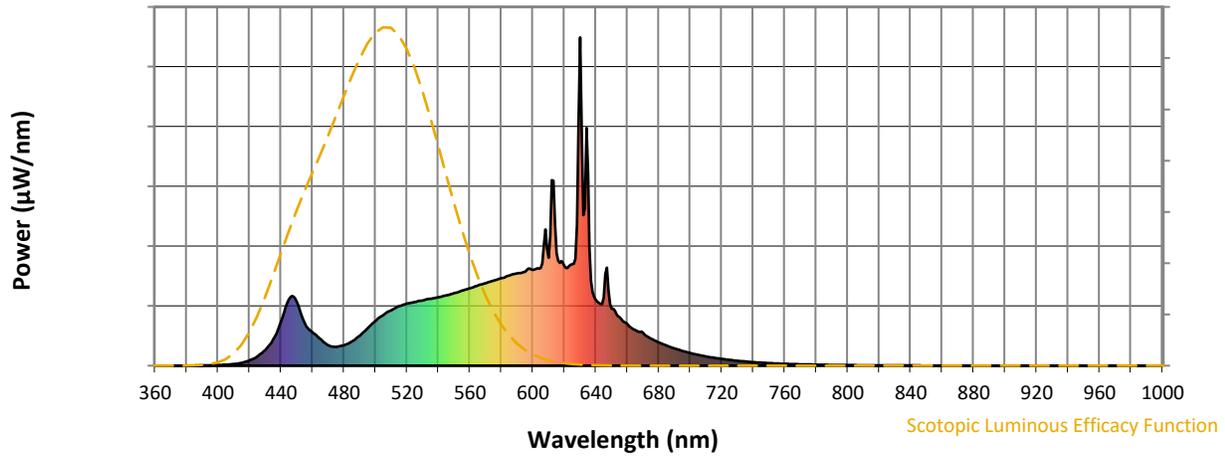


Photopic Lumens: NR

| 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 | 92 | NR | 620 | 304 | NR | 750 | 8 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 114 | NR | 625 | 309 | NR | 755 | 7 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 136 | NR | 630 | 1000 | NR | 760 | 6 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 154 | NR | 635 | 582 | NR | 765 | 5 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 169 | NR | 640 | 200 | NR | 770 | 4 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 181 | NR | 645 | 207 | NR | 775 | 4 | NR | 905 | 0 | NR |
| 390 | 1 | NR | 520 | 189 | NR | 650 | 174 | NR | 780 | 3 | NR | 910 | 0 | NR |
| 395 | 1 | NR | 525 | 194 | NR | 655 | 148 | NR | 785 | 3 | NR | 915 | 0 | NR |
| 400 | 2 | NR | 530 | 199 | NR | 660 | 127 | NR | 790 | 2 | NR | 920 | 0 | NR |
| 405 | 3 | NR | 535 | 203 | NR | 665 | 108 | NR | 795 | 2 | NR | 925 | 0 | NR |
| 410 | 5 | NR | 540 | 208 | NR | 670 | 100 | NR | 800 | 2 | NR | 930 | 0 | NR |
| 415 | 9 | NR | 545 | 214 | NR | 675 | 83 | NR | 805 | 2 | NR | 935 | 0 | NR |
| 420 | 16 | NR | 550 | 221 | NR | 680 | 71 | NR | 810 | 1 | NR | 940 | 0 | NR |
| 425 | 28 | NR | 555 | 228 | NR | 685 | 61 | NR | 815 | 1 | NR | 945 | 0 | NR |
| 430 | 48 | NR | 560 | 236 | NR | 690 | 53 | NR | 820 | 1 | NR | 950 | 0 | NR |
| 435 | 80 | NR | 565 | 244 | NR | 695 | 45 | NR | 825 | 1 | NR | 955 | 0 | NR |
| 440 | 135 | NR | 570 | 251 | NR | 700 | 38 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 202 | NR | 575 | 259 | NR | 705 | 33 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 195 | NR | 580 | 266 | NR | 710 | 28 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 130 | NR | 585 | 274 | NR | 715 | 24 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 101 | NR | 590 | 281 | NR | 720 | 20 | NR | 850 | 0 | NR | 980 | 0 | NR |
| 465 | 82 | NR | 595 | 286 | NR | 725 | 17 | NR | 855 | 0 | NR | 985 | 0 | NR |
| 470 | 62 | NR | 600 | 292 | NR | 730 | 15 | NR | 860 | 0 | NR | 990 | 0 | NR |
| 475 | 58 | NR | 605 | 298 | NR | 735 | 13 | NR | 865 | 0 | NR | 995 | 0 | NR |
| 480 | 62 | NR | 610 | 328 | NR | 740 | 11 | NR | 870 | 0 | NR | 1000 | 0 | NR |
| 485 | 74 | NR | 615 | 342 | NR | 745 | 9 | NR | 875 | 0 | NR | | | |

REPORT NUMBER: SP1-2511-597-3

Scotopic Flux vs. Wavelength



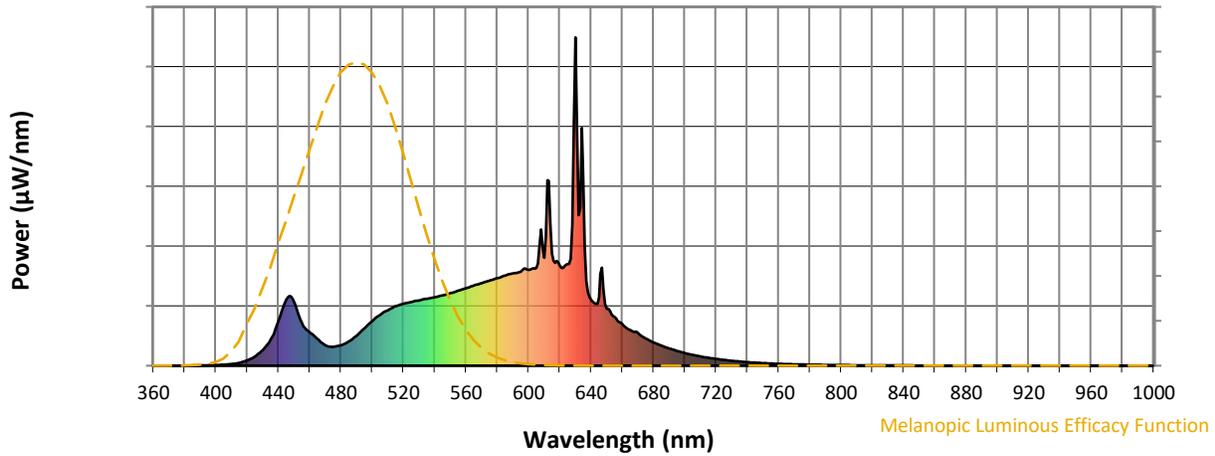
Scotopic Lumens: NR

S/P: 1.42

| 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 | 92 | NR | 620 | 304 | NR | 750 | 8 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 114 | NR | 625 | 309 | NR | 755 | 7 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 136 | NR | 630 | 1000 | NR | 760 | 6 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 154 | NR | 635 | 582 | NR | 765 | 5 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 169 | NR | 640 | 200 | NR | 770 | 4 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 181 | NR | 645 | 207 | NR | 775 | 4 | NR | 905 | 0 | NR |
| 390 | 1 | NR | 520 | 189 | NR | 650 | 174 | NR | 780 | 3 | NR | 910 | 0 | NR |
| 395 | 1 | NR | 525 | 194 | NR | 655 | 148 | NR | 785 | 3 | NR | 915 | 0 | NR |
| 400 | 2 | NR | 530 | 199 | NR | 660 | 127 | NR | 790 | 2 | NR | 920 | 0 | NR |
| 405 | 3 | NR | 535 | 203 | NR | 665 | 108 | NR | 795 | 2 | NR | 925 | 0 | NR |
| 410 | 5 | NR | 540 | 208 | NR | 670 | 100 | NR | 800 | 2 | NR | 930 | 0 | NR |
| 415 | 9 | NR | 545 | 214 | NR | 675 | 83 | NR | 805 | 2 | NR | 935 | 0 | NR |
| 420 | 16 | NR | 550 | 221 | NR | 680 | 71 | NR | 810 | 1 | NR | 940 | 0 | NR |
| 425 | 28 | NR | 555 | 228 | NR | 685 | 61 | NR | 815 | 1 | NR | 945 | 0 | NR |
| 430 | 48 | NR | 560 | 236 | NR | 690 | 53 | NR | 820 | 1 | NR | 950 | 0 | NR |
| 435 | 80 | NR | 565 | 244 | NR | 695 | 45 | NR | 825 | 1 | NR | 955 | 0 | NR |
| 440 | 135 | NR | 570 | 251 | NR | 700 | 38 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 202 | NR | 575 | 259 | NR | 705 | 33 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 195 | NR | 580 | 266 | NR | 710 | 28 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 130 | NR | 585 | 274 | NR | 715 | 24 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 101 | NR | 590 | 281 | NR | 720 | 20 | NR | 850 | 0 | NR | 980 | 0 | NR |
| 465 | 82 | NR | 595 | 286 | NR | 725 | 17 | NR | 855 | 0 | NR | 985 | 0 | NR |
| 470 | 62 | NR | 600 | 292 | NR | 730 | 15 | NR | 860 | 0 | NR | 990 | 0 | NR |
| 475 | 58 | NR | 605 | 298 | NR | 735 | 13 | NR | 865 | 0 | NR | 995 | 0 | NR |
| 480 | 62 | NR | 610 | 328 | NR | 740 | 11 | NR | 870 | 0 | NR | 1000 | 0 | NR |
| 485 | 74 | NR | 615 | 342 | NR | 745 | 9 | NR | 875 | 0 | NR | | | |

REPORT NUMBER: SP1-2511-597-3

Melanopic Flux vs. Wavelength



Melanopic Lumens: NR

M/P: 2.76

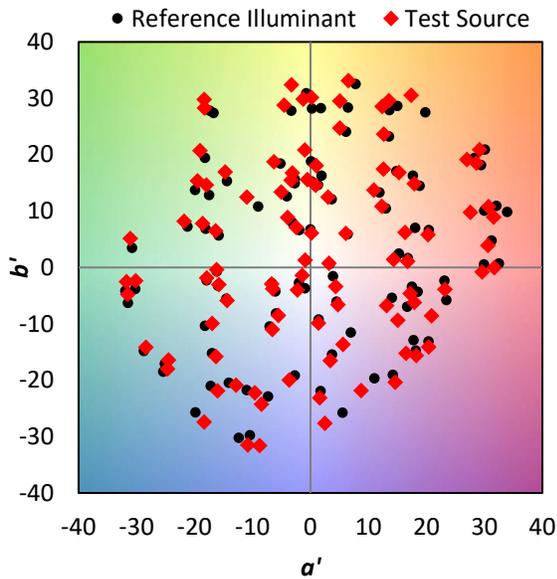
| λ (nm) | Power W [^] /nm | Lumens (φ/nm) | λ (nm) | Power W [^] /nm | Lumens (φ/nm) | λ (nm) | Power W [^] /nm | Lumens (φ/nm) | λ (nm) | Power W [^] /nm | Lumens (φ/nm) | λ (nm) | Power W [^] /nm | Lumens (φ/nm) |
|----------------|--------------------------|---------------|----------------|--------------------------|---------------|----------------|--------------------------|---------------|----------------|--------------------------|---------------|----------------|--------------------------|---------------|
| 360 | 0 | NR | 490 | 92 | NR | 620 | 304 | NR | 750 | 8 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 114 | NR | 625 | 309 | NR | 755 | 7 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 136 | NR | 630 | 1000 | NR | 760 | 6 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 154 | NR | 635 | 582 | NR | 765 | 5 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 169 | NR | 640 | 200 | NR | 770 | 4 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 181 | NR | 645 | 207 | NR | 775 | 4 | NR | 905 | 0 | NR |
| 390 | 1 | NR | 520 | 189 | NR | 650 | 174 | NR | 780 | 3 | NR | 910 | 0 | NR |
| 395 | 1 | NR | 525 | 194 | NR | 655 | 148 | NR | 785 | 3 | NR | 915 | 0 | NR |
| 400 | 2 | NR | 530 | 199 | NR | 660 | 127 | NR | 790 | 2 | NR | 920 | 0 | NR |
| 405 | 3 | NR | 535 | 203 | NR | 665 | 108 | NR | 795 | 2 | NR | 925 | 0 | NR |
| 410 | 5 | NR | 540 | 208 | NR | 670 | 100 | NR | 800 | 2 | NR | 930 | 0 | NR |
| 415 | 9 | NR | 545 | 214 | NR | 675 | 83 | NR | 805 | 2 | NR | 935 | 0 | NR |
| 420 | 16 | NR | 550 | 221 | NR | 680 | 71 | NR | 810 | 1 | NR | 940 | 0 | NR |
| 425 | 28 | NR | 555 | 228 | NR | 685 | 61 | NR | 815 | 1 | NR | 945 | 0 | NR |
| 430 | 48 | NR | 560 | 236 | NR | 690 | 53 | NR | 820 | 1 | NR | 950 | 0 | NR |
| 435 | 80 | NR | 565 | 244 | NR | 695 | 45 | NR | 825 | 1 | NR | 955 | 0 | NR |
| 440 | 135 | NR | 570 | 251 | NR | 700 | 38 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 202 | NR | 575 | 259 | NR | 705 | 33 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 195 | NR | 580 | 266 | NR | 710 | 28 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 130 | NR | 585 | 274 | NR | 715 | 24 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 101 | NR | 590 | 281 | NR | 720 | 20 | NR | 850 | 0 | NR | 980 | 0 | NR |
| 465 | 82 | NR | 595 | 286 | NR | 725 | 17 | NR | 855 | 0 | NR | 985 | 0 | NR |
| 470 | 62 | NR | 600 | 292 | NR | 730 | 15 | NR | 860 | 0 | NR | 990 | 0 | NR |
| 475 | 58 | NR | 605 | 298 | NR | 735 | 13 | NR | 865 | 0 | NR | 995 | 0 | NR |
| 480 | 62 | NR | 610 | 328 | NR | 740 | 11 | NR | 870 | 0 | NR | 1000 | 0 | NR |
| 485 | 74 | NR | 615 | 342 | NR | 745 | 9 | NR | 875 | 0 | NR | | | |

Summary

$R_f = 90.1$
 $R_g = 103.3$
 CIE $R_a = 93.9$
 $R_9 = 62.0$

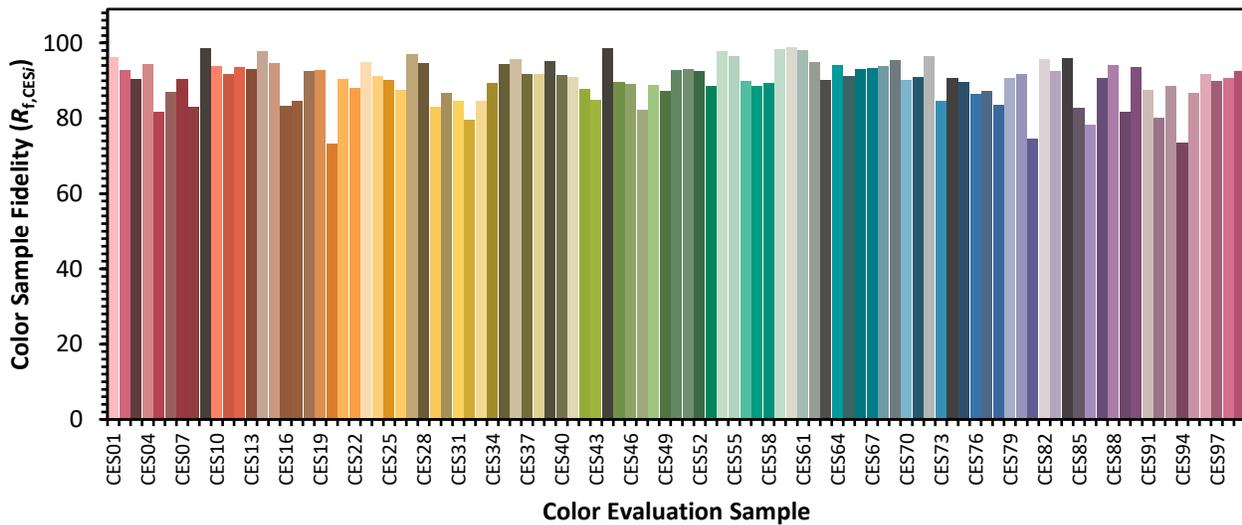


Color Vector Graphics



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

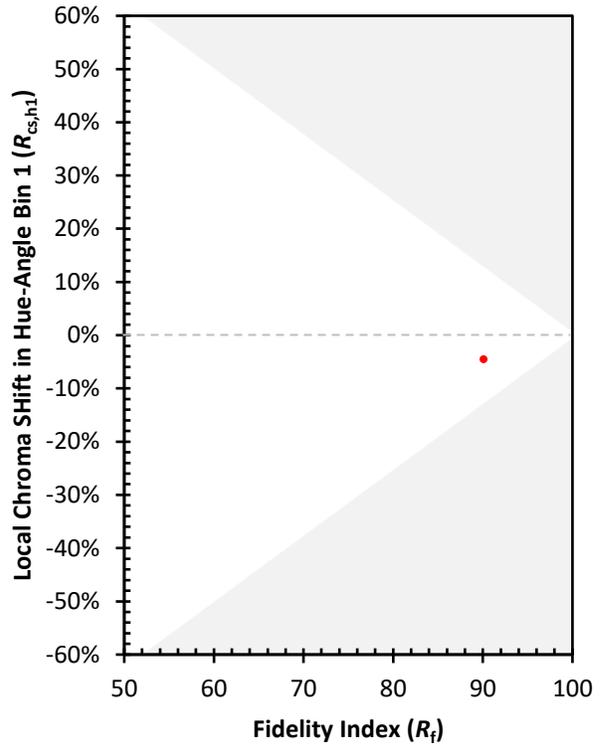
| | | | |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 88 | CES51 = 93 | CES76 = 86 |
| CES02 = 63 | CES27 = 97 | CES52 = 93 | CES77 = 87 |
| CES03 = 32 | CES28 = 95 | CES53 = 89 | CES78 = 83 |
| CES04 = 70 | CES29 = 83 | CES54 = 98 | CES79 = 91 |
| CES05 = 51 | CES30 = 87 | CES55 = 97 | CES80 = 92 |
| CES06 = 51 | CES31 = 85 | CES56 = 90 | CES81 = 75 |
| CES07 = 44 | CES32 = 80 | CES57 = 89 | CES82 = 96 |
| CES08 = 42 | CES33 = 85 | CES58 = 89 | CES83 = 92 |
| CES09 = 29 | CES34 = 89 | CES59 = 98 | CES84 = 96 |
| CES10 = 76 | CES35 = 94 | CES60 = 99 | CES85 = 83 |
| CES11 = 59 | CES36 = 96 | CES61 = 98 | CES86 = 78 |
| CES12 = 65 | CES37 = 92 | CES62 = 95 | CES87 = 91 |
| CES13 = 44 | CES38 = 92 | CES63 = 90 | CES88 = 94 |
| CES14 = 74 | CES39 = 95 | CES64 = 94 | CES89 = 82 |
| CES15 = 72 | CES40 = 91 | CES65 = 91 | CES90 = 94 |
| CES16 = 48 | CES41 = 91 | CES66 = 93 | CES91 = 87 |
| CES17 = 50 | CES42 = 88 | CES67 = 93 | CES92 = 80 |
| CES18 = 57 | CES43 = 85 | CES68 = 94 | CES93 = 89 |
| CES19 = 72 | CES44 = 99 | CES69 = 96 | CES94 = 74 |
| CES20 = 67 | CES45 = 90 | CES70 = 90 | CES95 = 87 |
| CES21 = 86 | CES46 = 89 | CES71 = 91 | CES96 = 92 |
| CES22 = 79 | CES47 = 82 | CES72 = 96 | CES97 = 90 |
| CES23 = 92 | CES48 = 89 | CES73 = 85 | CES98 = 91 |
| CES24 = 91 | CES49 = 87 | CES74 = 91 | CES99 = 93 |
| CES25 = 72 | CES50 = 93 | CES75 = 90 | |



Color Rendition by Hue-Angle Bin



Measure Comparisons



(END OF REPORT)