

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: P1357024

Luminaire Tested: 3ASL4-20HE-2-27-UNV

Issue Date: 2/17/2026

Test Information

Test Method: LM-79-2019
Report Number: P1357024
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: 3ASL4-20HE-2-27-UNV
Description: 3FT 2000 LUMEN PER FOOT 4ASL LED LUMINAIRE WITH OPL LENS AND 2700K LEDS 2 ROW
Light Source: -
Ballast/Driver: -

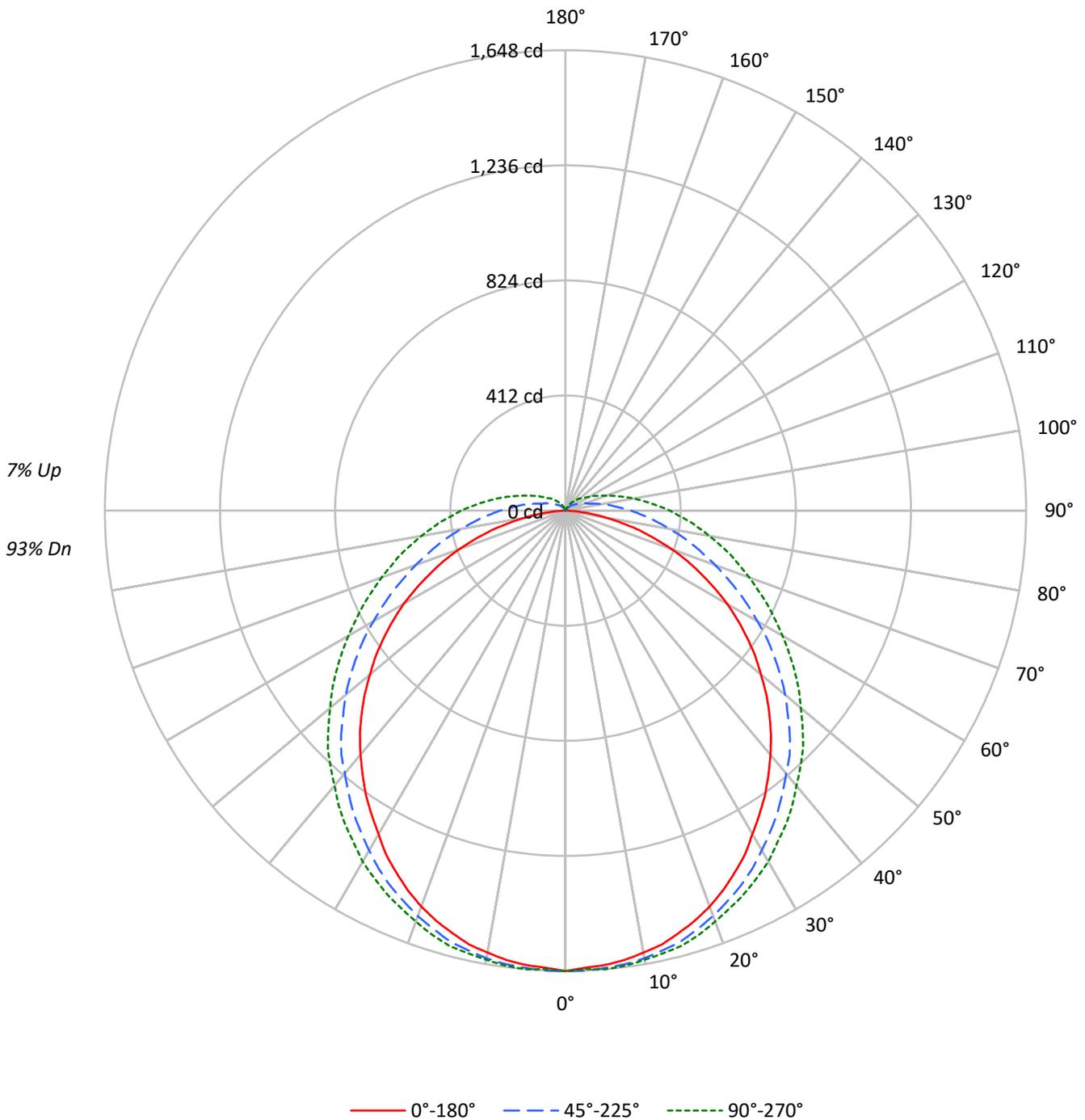
Summary

Lumens per Lamp: N/A
Luminaire Lumens: 5658.0 lumens
Efficiency: N/A
Efficacy: 105.4 lumens/watt
Spacing Criteria (0/90/45): 1.21 / 1.3 / 1.4
Luminous Opening: Rectangular w/ Sides (W: 0.33' x L: 2.98' x H: 0.1')
CIE Type: Direct

Input Watts (W): 53.7
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: P1357024
CATALOG NUMBER: 3ASL4-20HE-2-27-UNV

Luminous Intensity Polar Plot





TEST NUMBER: P1357024

CATALOG NUMBER: 3ASL4-20HE-2-27-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° | 17864 | 17864 | 17864 |
| 5° | 17710 | 17500 | 17455 |
| 10° | 17576 | 17168 | 17031 |
| 15° | 17401 | 16807 | 16690 |
| 20° | 17178 | 16353 | 16211 |
| 25° | 16833 | 15906 | 15798 |
| 30° | 16405 | 15395 | 15387 |
| 35° | 16066 | 14921 | 14911 |
| 40° | 15674 | 14409 | 14408 |
| 45° | 15276 | 13967 | 14043 |
| 50° | 14767 | 13385 | 13500 |
| 55° | 14273 | 12761 | 13070 |
| 60° | 13667 | 12059 | 12611 |
| 65° | 12736 | 11404 | 12256 |
| 70° | 11690 | 10786 | 11931 |
| 75° | 10176 | 10303 | 11824 |
| 80° | 7829 | 9866 | 11787 |
| 85° | 4603 | 9817 | 12124 |

MAXIMUM LUMINANCE 45°-90°:

Horizontal Angle: 0°
 Vertical Angle: 45°
 Luminance: 15276 cd/sqm



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ZONAL LUMENS:

| Zone | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10° | 156.3 | 2.8 |
| 10°-20° | 449.3 | 7.9 |
| 20°-30° | 680.8 | 12.0 |
| 30°-40° | 823.4 | 14.6 |
| 40°-50° | 868.0 | 15.3 |
| 50°-60° | 810.2 | 14.3 |
| 60°-70° | 668.9 | 11.8 |
| 70°-80° | 485.2 | 8.6 |
| 80°-90° | 306.6 | 5.4 |
| 90°-100° | 183.0 | 3.2 |
| 100°-110° | 104.9 | 1.9 |
| 110°-120° | 59.6 | 1.1 |
| 120°-130° | 34.0 | 0.6 |
| 130°-140° | 18.4 | 0.3 |
| 140°-150° | 8.1 | 0.1 |
| 150°-160° | 1.5 | 0.0 |
| 160°-170° | 0.0 | 0.0 |
| 170°-180° | 0.0 | 0.0 |
| 0°-30° | 1286.4 | 22.7 |
| 0°-40° | 2109.7 | 37.3 |
| 0°-60° | 3788.0 | 66.9 |
| 0°-90° | 5248.6 | 92.8 |
| 90°-120° | 347.5 | 6.1 |
| 90°-150° | 407.9 | 7.2 |
| 90°-180° | 409.0 | 7.2 |
| 0°-180° | 5658.0 | 100.0 |

CANDELA DISTRIBUTION:

| | 0° | 22.5° | 45° | 67.5° | 90° | Flux |
|------|------|-------|------|-------|------|------|
| 0° | 1648 | 1648 | 1648 | 1648 | 1648 | |
| 5° | 1633 | 1648 | 1643 | 1643 | 1648 | 155 |
| 15° | 1565 | 1586 | 1596 | 1602 | 1612 | 442 |
| 25° | 1430 | 1451 | 1482 | 1503 | 1513 | 659 |
| 35° | 1244 | 1275 | 1322 | 1358 | 1373 | 777 |
| 45° | 1031 | 1073 | 1135 | 1182 | 1202 | 795 |
| 55° | 793 | 840 | 912 | 974 | 1000 | 709 |
| 65° | 534 | 591 | 679 | 762 | 798 | 530 |
| 75° | 275 | 347 | 472 | 570 | 612 | 289 |
| 85° | 52 | 161 | 301 | 404 | 446 | 63 |
| 90° | 0 | 98 | 233 | 332 | 373 | 2 |
| 95° | 0 | 62 | 176 | 270 | 306 | 0 |
| 105° | 0 | 21 | 98 | 171 | 197 | 0 |
| 115° | 0 | 10 | 57 | 104 | 124 | 0 |
| 125° | 0 | 5 | 36 | 67 | 78 | 0 |
| 135° | 0 | 0 | 21 | 42 | 52 | 0 |
| 145° | 0 | 0 | 10 | 26 | 31 | 0 |
| 155° | 0 | 0 | 0 | 5 | 10 | 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: 3ASL4-20HE-2-27-UNV

CANDELA DISTRIBUTION (FULL):

| | 0° | 22.5° | 45° | 67.5° | 90° |
|--------|--------|--------|--------|--------|--------|
| 0° | 1648.1 | 1648.1 | 1648.1 | 1648.1 | 1648.1 |
| 2.5° | 1637.8 | 1653.3 | 1648.1 | 1642.9 | 1642.9 |
| 5° | 1632.6 | 1648.1 | 1642.9 | 1642.9 | 1648.1 |
| 7.5° | 1622.2 | 1637.8 | 1637.8 | 1637.8 | 1642.9 |
| 10° | 1606.7 | 1627.4 | 1627.4 | 1627.4 | 1632.6 |
| 12.5° | 1591.1 | 1606.7 | 1611.8 | 1617.0 | 1622.2 |
| 15° | 1565.2 | 1585.9 | 1596.3 | 1601.5 | 1611.8 |
| 17.5° | 1539.3 | 1554.8 | 1570.4 | 1585.9 | 1591.1 |
| 20° | 1508.2 | 1528.9 | 1544.5 | 1560.0 | 1565.2 |
| 22.5° | 1471.9 | 1492.6 | 1513.4 | 1528.9 | 1539.3 |
| 25° | 1430.4 | 1451.2 | 1482.3 | 1503.0 | 1513.4 |
| 27.5° | 1389.0 | 1409.7 | 1446.0 | 1471.9 | 1482.3 |
| 30° | 1337.2 | 1368.2 | 1404.5 | 1435.6 | 1451.2 |
| 32.5° | 1290.5 | 1321.6 | 1363.1 | 1399.3 | 1409.7 |
| 35° | 1243.9 | 1275.0 | 1321.6 | 1357.9 | 1373.4 |
| 37.5° | 1192.0 | 1228.3 | 1275.0 | 1316.4 | 1332.0 |
| 40° | 1140.2 | 1176.5 | 1228.3 | 1275.0 | 1285.3 |
| 42.5° | 1088.4 | 1124.7 | 1186.9 | 1228.3 | 1243.9 |
| 45° | 1031.4 | 1072.8 | 1135.0 | 1181.7 | 1202.4 |
| 47.5° | 974.4 | 1015.8 | 1078.0 | 1129.8 | 1150.6 |
| 50° | 912.2 | 958.8 | 1026.2 | 1078.0 | 1098.7 |
| 52.5° | 855.2 | 901.8 | 969.2 | 1026.2 | 1052.1 |
| 55° | 793.0 | 839.6 | 912.2 | 974.4 | 1000.3 |
| 57.5° | 730.8 | 777.4 | 855.2 | 922.5 | 948.4 |
| 60° | 668.6 | 715.2 | 793.0 | 870.7 | 896.6 |
| 62.5° | 601.2 | 653.0 | 736.0 | 813.7 | 844.8 |
| 65° | 533.8 | 590.8 | 678.9 | 761.9 | 798.1 |
| 67.5° | 471.6 | 528.6 | 621.9 | 715.2 | 746.3 |
| 70° | 404.3 | 466.4 | 570.1 | 663.4 | 699.7 |
| 72.5° | 336.9 | 404.3 | 518.3 | 616.7 | 653.0 |
| 75° | 274.7 | 347.2 | 471.6 | 570.1 | 611.6 |
| 77.5° | 207.3 | 295.4 | 425.0 | 528.6 | 564.9 |
| 80° | 150.3 | 243.6 | 378.3 | 487.2 | 523.5 |
| 82.5° | 98.5 | 196.9 | 336.9 | 445.7 | 482.0 |
| 85° | 51.8 | 160.7 | 300.6 | 404.3 | 445.7 |
| 87.5° | 15.5 | 124.4 | 264.3 | 368.0 | 404.3 |
| 90° | 0.0 | 98.5 | 233.2 | 331.7 | 373.2 |
| 92.5° | 0.0 | 77.7 | 202.1 | 300.6 | 336.9 |
| 95° | 0.0 | 62.2 | 176.2 | 269.5 | 305.8 |
| 97.5° | 0.0 | 51.8 | 155.5 | 243.6 | 274.7 |
| 100° | 0.0 | 41.5 | 134.8 | 217.7 | 248.8 |
| 102.5° | 0.0 | 31.1 | 114.0 | 191.8 | 222.9 |
| 105° | 0.0 | 20.7 | 98.5 | 171.0 | 196.9 |
| 107.5° | 0.0 | 15.5 | 82.9 | 150.3 | 176.2 |
| 110° | 0.0 | 15.5 | 77.7 | 129.6 | 155.5 |



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CANDELA DISTRIBUTION (continued):

| | 0° | 22.5° | 45° | 67.5° | 90° |
|--------|-----|-------|------|-------|-------|
| 112.5° | 0.0 | 10.4 | 67.4 | 119.2 | 139.9 |
| 115° | 0.0 | 10.4 | 57.0 | 103.7 | 124.4 |
| 117.5° | 0.0 | 10.4 | 51.8 | 93.3 | 114.0 |
| 120° | 0.0 | 10.4 | 46.6 | 82.9 | 98.5 |
| 122.5° | 0.0 | 5.2 | 41.5 | 72.6 | 88.1 |
| 125° | 0.0 | 5.2 | 36.3 | 67.4 | 77.7 |
| 127.5° | 0.0 | 5.2 | 31.1 | 62.2 | 72.6 |
| 130° | 0.0 | 5.2 | 31.1 | 57.0 | 67.4 |
| 132.5° | 0.0 | 0.0 | 25.9 | 51.8 | 62.2 |
| 135° | 0.0 | 0.0 | 20.7 | 41.5 | 51.8 |
| 137.5° | 0.0 | 0.0 | 20.7 | 36.3 | 46.6 |
| 140° | 0.0 | 0.0 | 15.5 | 36.3 | 41.5 |
| 142.5° | 0.0 | 0.0 | 10.4 | 31.1 | 36.3 |
| 145° | 0.0 | 0.0 | 10.4 | 25.9 | 31.1 |
| 147.5° | 0.0 | 0.0 | 5.2 | 20.7 | 25.9 |
| 150° | 0.0 | 0.0 | 5.2 | 15.5 | 20.7 |
| 152.5° | 0.0 | 0.0 | 0.0 | 10.4 | 15.5 |
| 155° | 0.0 | 0.0 | 0.0 | 5.2 | 10.4 |
| 157.5° | 0.0 | 0.0 | 0.0 | 0.0 | 5.2 |
| 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 | 19.32 | 20.85 | 19.79 | 21.31 | 21.80 | 21.35 | 22.88 | 21.82 | 23.34 | 23.83 |
| | 3H | 20.82 | 22.22 | 21.31 | 22.69 | 23.22 | 23.79 | 25.19 | 24.27 | 25.66 | 26.19 |
| | 4H | 21.30 | 22.63 | 21.81 | 23.12 | 23.66 | 24.99 | 26.31 | 25.49 | 26.80 | 27.35 |
| | 6H | 21.58 | 22.81 | 22.10 | 23.31 | 23.87 | 26.24 | 27.48 | 26.76 | 27.98 | 28.54 |
| | 8H | 21.63 | 22.82 | 22.16 | 23.34 | 23.91 | 26.89 | 28.07 | 27.42 | 28.60 | 29.16 |
| | 12H | 21.65 | 22.78 | 22.18 | 23.30 | 23.90 | 27.59 | 28.73 | 28.13 | 29.25 | 29.84 |
| 4H | 2H | 20.19 | 21.52 | 20.70 | 22.01 | 22.55 | 21.78 | 23.11 | 22.29 | 23.60 | 24.14 |
| | 3H | 21.93 | 23.07 | 22.45 | 23.60 | 24.16 | 24.45 | 25.58 | 24.97 | 26.11 | 26.68 |
| | 4H | 22.54 | 23.58 | 23.08 | 24.12 | 24.72 | 25.82 | 26.86 | 26.36 | 27.40 | 28.00 |
| | 6H | 22.95 | 23.86 | 23.50 | 24.43 | 25.04 | 27.28 | 28.19 | 27.83 | 28.76 | 29.37 |
| | 8H | 23.04 | 23.90 | 23.61 | 24.47 | 25.10 | 28.03 | 28.89 | 28.59 | 29.46 | 30.08 |
| | 12H | 23.09 | 23.87 | 23.68 | 24.47 | 25.10 | 28.86 | 29.64 | 29.45 | 30.24 | 30.87 |
| 8H | 4H | 23.23 | 24.09 | 23.80 | 24.66 | 25.29 | 26.05 | 26.91 | 26.61 | 27.47 | 28.10 |
| | 6H | 23.82 | 24.55 | 24.42 | 25.16 | 25.79 | 27.67 | 28.40 | 28.27 | 29.01 | 29.64 |
| | 8H | 24.01 | 24.67 | 24.61 | 25.29 | 25.93 | 28.57 | 29.23 | 29.18 | 29.85 | 30.49 |
| | 12H | 24.13 | 24.72 | 24.74 | 25.32 | 26.03 | 29.59 | 30.18 | 30.20 | 30.79 | 31.50 |
| 12H | 4H | 23.43 | 24.21 | 24.02 | 24.81 | 25.44 | 26.05 | 26.84 | 26.64 | 27.43 | 28.06 |
| | 6H | 24.12 | 24.78 | 24.73 | 25.40 | 26.04 | 27.71 | 28.37 | 28.32 | 28.99 | 29.64 |
| | 8H | 24.41 | 25.00 | 25.02 | 25.60 | 26.31 | 28.68 | 29.27 | 29.29 | 29.88 | 30.59 |

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

Report Prepared for

Cooper Lighting Solutions

Fail-Safe

Report Number: SP1-2511-597-2

Test Date: 11/17/2025

Luminaire Tested: 4ASL-2-27-UNV-OPL-1_600mA

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

Test Information

Test Method: LM-79-2019
 Report Number: SP1-2511-597-2
 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-2-27-UNV-OPL-1_600mA**
 Description: 2foot 4ASL LED LUMINAIRE WITH OPL LENS AND 2700K LEDs with 1 rows at 600mA

Spectral Parameters

CCT (K): 2696
 CIE u': 0.2632
 CIE v': 0.5245
 Duv: -0.0020
 CIE x: 0.4568
 CIE y: 0.4045
 CIE z: 0.1387
 Peak Wavelength (nm): 630
 Dominant Wavelength (nm): 584
 Purity: 58.52757
 Rf: 90.1
 Rg: 103.5

| | | | |
|-----------|------|------|------|
| CRI (Ra): | 94.4 | | |
| R1: | 97.5 | R9: | 61.8 |
| R2: | 97.8 | R10: | 93.6 |
| R3: | 96.9 | R11: | 93.7 |
| R4: | 95.3 | R12: | 94.1 |
| R5: | 97.2 | R13: | 97.6 |
| R6: | 96.5 | R14: | 96.8 |
| R7: | 91.2 | R15: | 91.9 |
| R8: | 83.2 | | |



Test Conditions

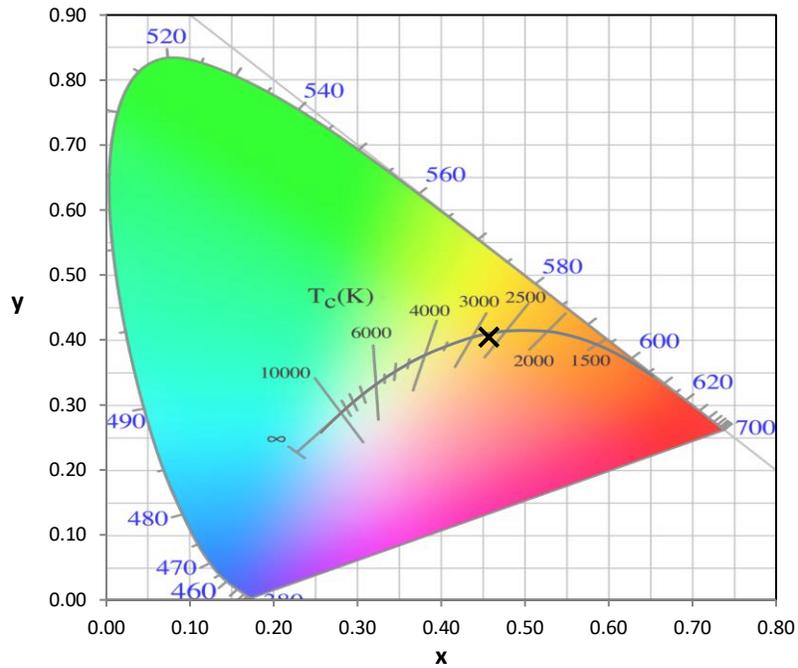
Stabilization Time: 32M
 Operation Time: 1H 32M
 Sphere Temperature (°C): 24.1

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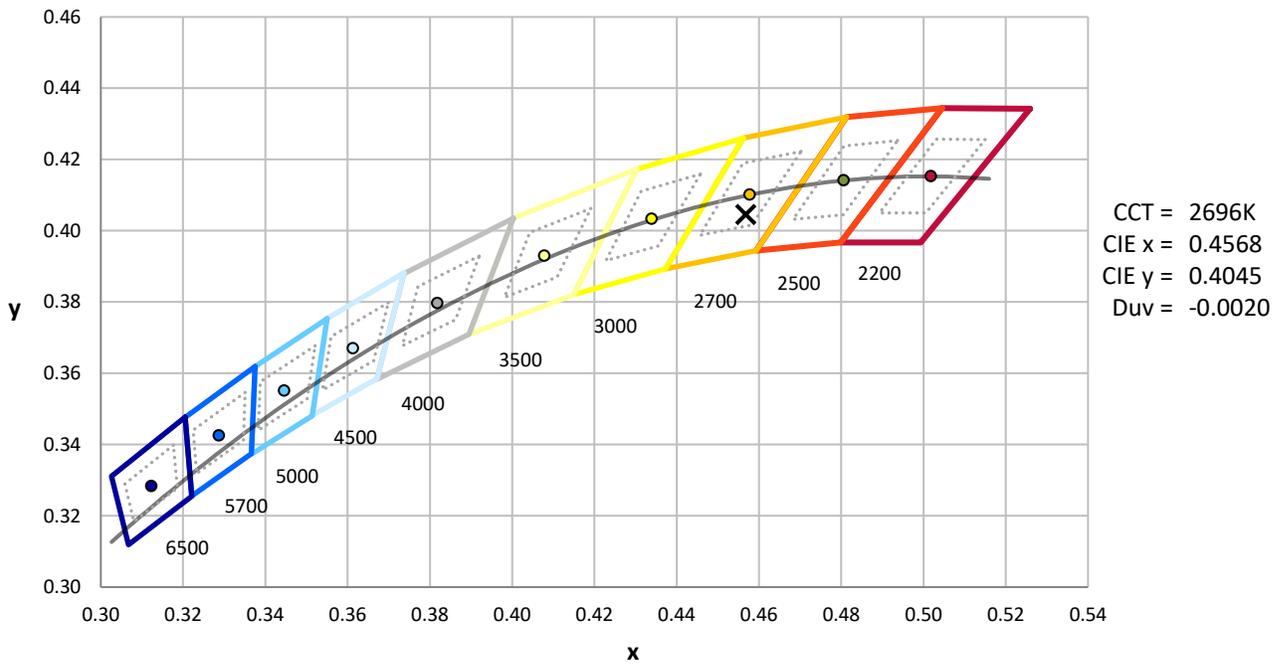
| Measurement and Test Equipment | | | |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument | Identification Number | Calibration Date | Calibration Due Date |
| Photometer | 76INCH SPHERE IN0058 | 6/16/2025 | 12/16/2025 |
| Power Meter |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



Point lies inside the ANSI 2700K 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 | 70 | NR | 620 | 281 | NR | 750 | 7 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 88 | NR | 625 | 288 | NR | 755 | 6 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 106 | NR | 630 | 1000 | NR | 760 | 5 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 121 | NR | 635 | 581 | NR | 765 | 5 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 133 | NR | 640 | 184 | NR | 770 | 4 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 143 | NR | 645 | 191 | NR | 775 | 3 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 149 | NR | 650 | 161 | NR | 780 | 3 | NR | 910 | 0 | NR |
| 395 | 1 | NR | 525 | 155 | NR | 655 | 136 | NR | 785 | 2 | NR | 915 | 0 | NR |
| 400 | 1 | NR | 530 | 158 | NR | 660 | 116 | NR | 790 | 2 | NR | 920 | 0 | NR |
| 405 | 2 | NR | 535 | 163 | NR | 665 | 99 | NR | 795 | 2 | NR | 925 | 0 | NR |
| 410 | 3 | NR | 540 | 168 | NR | 670 | 92 | NR | 800 | 2 | NR | 930 | 0 | NR |
| 415 | 6 | NR | 545 | 173 | NR | 675 | 75 | NR | 805 | 1 | NR | 935 | 0 | NR |
| 420 | 11 | NR | 550 | 179 | NR | 680 | 65 | NR | 810 | 1 | NR | 940 | 0 | NR |
| 425 | 19 | NR | 555 | 187 | NR | 685 | 56 | NR | 815 | 1 | NR | 945 | 0 | NR |
| 430 | 32 | NR | 560 | 195 | NR | 690 | 48 | NR | 820 | 1 | NR | 950 | 0 | NR |
| 435 | 54 | NR | 565 | 203 | NR | 695 | 41 | NR | 825 | 1 | NR | 955 | 0 | NR |
| 440 | 90 | NR | 570 | 211 | NR | 700 | 35 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 134 | NR | 575 | 219 | NR | 705 | 30 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 128 | NR | 580 | 228 | NR | 710 | 26 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 83 | NR | 585 | 237 | NR | 715 | 22 | NR | 845 | 0 | NR | 975 | 0 | NR |
| 460 | 67 | NR | 590 | 246 | NR | 720 | 19 | NR | 850 | 0 | NR | 980 | 0 | NR |
| 465 | 55 | NR | 595 | 251 | NR | 725 | 16 | NR | 855 | 0 | NR | 985 | 0 | NR |
| 470 | 42 | NR | 600 | 259 | NR | 730 | 13 | NR | 860 | 0 | NR | 990 | 0 | NR |
| 475 | 41 | NR | 605 | 266 | NR | 735 | 11 | NR | 865 | 0 | NR | 995 | 0 | NR |
| 480 | 46 | NR | 610 | 299 | NR | 740 | 10 | NR | 870 | 0 | NR | 1000 | 0 | NR |
| 485 | 55 | NR | 615 | 317 | NR | 745 | 8 | NR | 875 | 0 | NR | | | |

REPORT NUMBER: SP1-2511-597-2

Scotopic Flux vs. Wavelength



Scotopic Lumens: NR

S/P: 1.29

| 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 | 70 | NR | 620 | 281 | NR | 750 | 7 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 88 | NR | 625 | 288 | NR | 755 | 6 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 106 | NR | 630 | 1000 | NR | 760 | 5 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 121 | NR | 635 | 581 | NR | 765 | 5 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 133 | NR | 640 | 184 | NR | 770 | 4 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 143 | NR | 645 | 191 | NR | 775 | 3 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 149 | NR | 650 | 161 | NR | 780 | 3 | NR | 910 | 0 | NR |
| 395 | 1 | NR | 525 | 155 | NR | 655 | 136 | NR | 785 | 2 | NR | 915 | 0 | NR |
| 400 | 1 | NR | 530 | 158 | NR | 660 | 116 | NR | 790 | 2 | NR | 920 | 0 | NR |
| 405 | 2 | NR | 535 | 163 | NR | 665 | 99 | NR | 795 | 2 | NR | 925 | 0 | NR |
| 410 | 3 | NR | 540 | 168 | NR | 670 | 92 | NR | 800 | 2 | NR | 930 | 0 | NR |
| 415 | 6 | NR | 545 | 173 | NR | 675 | 75 | NR | 805 | 1 | NR | 935 | 0 | NR |
| 420 | 11 | NR | 550 | 179 | NR | 680 | 65 | NR | 810 | 1 | NR | 940 | 0 | NR |
| 425 | 19 | NR | 555 | 187 | NR | 685 | 56 | NR | 815 | 1 | NR | 945 | 0 | NR |
| 430 | 32 | NR | 560 | 195 | NR | 690 | 48 | NR | 820 | 1 | NR | 950 | 0 | NR |
| 435 | 54 | NR | 565 | 203 | NR | 695 | 41 | NR | 825 | 1 | NR | 955 | 0 | NR |
| 440 | 90 | NR | 570 | 211 | NR | 700 | 35 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 134 | NR | 575 | 219 | NR | 705 | 30 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 128 | NR | 580 | 228 | NR | 710 | 26 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 83 | NR | 585 | 237 | NR | 715 | 22 | NR | 845 | 0 | NR | 975 | 0 | NR |
| 460 | 67 | NR | 590 | 246 | NR | 720 | 19 | NR | 850 | 0 | NR | 980 | 0 | NR |
| 465 | 55 | NR | 595 | 251 | NR | 725 | 16 | NR | 855 | 0 | NR | 985 | 0 | NR |
| 470 | 42 | NR | 600 | 259 | NR | 730 | 13 | NR | 860 | 0 | NR | 990 | 0 | NR |
| 475 | 41 | NR | 605 | 266 | NR | 735 | 11 | NR | 865 | 0 | NR | 995 | 0 | NR |
| 480 | 46 | NR | 610 | 299 | NR | 740 | 10 | NR | 870 | 0 | NR | 1000 | 0 | NR |
| 485 | 55 | NR | 615 | 317 | NR | 745 | 8 | NR | 875 | 0 | NR | | | |

REPORT NUMBER: SP1-2511-597-2

Melanopic Flux vs. Wavelength



Melanopic Lumens: NR

M/P: 2.45

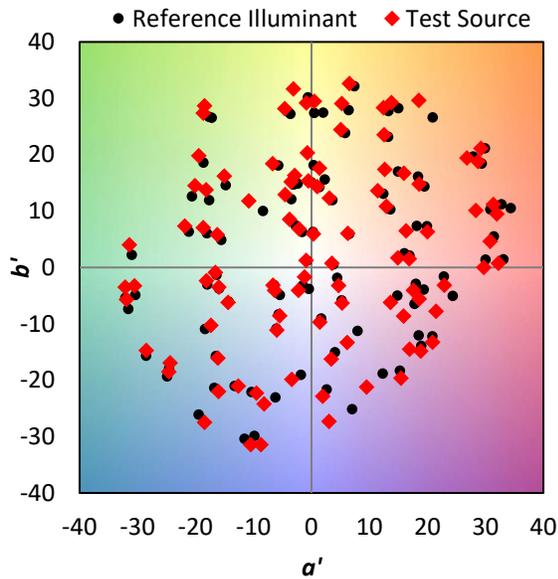
| λ (nm) | Power W [^] /nm | Lumens (φ/nm) | λ (nm) | Power W [^] /nm | Lumens (φ/nm) | λ (nm) | Power W [^] /nm | Lumens (φ/nm) | λ (nm) | Power W [^] /nm | Lumens (φ/nm) | λ (nm) | Power W [^] /nm | Lumens (φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360 | 0 | NR | 490 | 70 | NR | 620 | 281 | NR | 750 | 7 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 88 | NR | 625 | 288 | NR | 755 | 6 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 106 | NR | 630 | 1000 | NR | 760 | 5 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 121 | NR | 635 | 581 | NR | 765 | 5 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 133 | NR | 640 | 184 | NR | 770 | 4 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 143 | NR | 645 | 191 | NR | 775 | 3 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 149 | NR | 650 | 161 | NR | 780 | 3 | NR | 910 | 0 | NR |
| 395 | 1 | NR | 525 | 155 | NR | 655 | 136 | NR | 785 | 2 | NR | 915 | 0 | NR |
| 400 | 1 | NR | 530 | 158 | NR | 660 | 116 | NR | 790 | 2 | NR | 920 | 0 | NR |
| 405 | 2 | NR | 535 | 163 | NR | 665 | 99 | NR | 795 | 2 | NR | 925 | 0 | NR |
| 410 | 3 | NR | 540 | 168 | NR | 670 | 92 | NR | 800 | 2 | NR | 930 | 0 | NR |
| 415 | 6 | NR | 545 | 173 | NR | 675 | 75 | NR | 805 | 1 | NR | 935 | 0 | NR |
| 420 | 11 | NR | 550 | 179 | NR | 680 | 65 | NR | 810 | 1 | NR | 940 | 0 | NR |
| 425 | 19 | NR | 555 | 187 | NR | 685 | 56 | NR | 815 | 1 | NR | 945 | 0 | NR |
| 430 | 32 | NR | 560 | 195 | NR | 690 | 48 | NR | 820 | 1 | NR | 950 | 0 | NR |
| 435 | 54 | NR | 565 | 203 | NR | 695 | 41 | NR | 825 | 1 | NR | 955 | 0 | NR |
| 440 | 90 | NR | 570 | 211 | NR | 700 | 35 | NR | 830 | 1 | NR | 960 | 0 | NR |
| 445 | 134 | NR | 575 | 219 | NR | 705 | 30 | NR | 835 | 1 | NR | 965 | 0 | NR |
| 450 | 128 | NR | 580 | 228 | NR | 710 | 26 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 83 | NR | 585 | 237 | NR | 715 | 22 | NR | 845 | 0 | NR | 975 | 0 | NR |
| 460 | 67 | NR | 590 | 246 | NR | 720 | 19 | NR | 850 | 0 | NR | 980 | 0 | NR |
| 465 | 55 | NR | 595 | 251 | NR | 725 | 16 | NR | 855 | 0 | NR | 985 | 0 | NR |
| 470 | 42 | NR | 600 | 259 | NR | 730 | 13 | NR | 860 | 0 | NR | 990 | 0 | NR |
| 475 | 41 | NR | 605 | 266 | NR | 735 | 11 | NR | 865 | 0 | NR | 995 | 0 | NR |
| 480 | 46 | NR | 610 | 299 | NR | 740 | 10 | NR | 870 | 0 | NR | 1000 | 0 | NR |
| 485 | 55 | NR | 615 | 317 | NR | 745 | 8 | NR | 875 | 0 | NR | | | |

Summary

$R_f = 90.1$
 $R_g = 103.5$
 $CIE R_a = 94.4$
 $R_9 = 61.8$

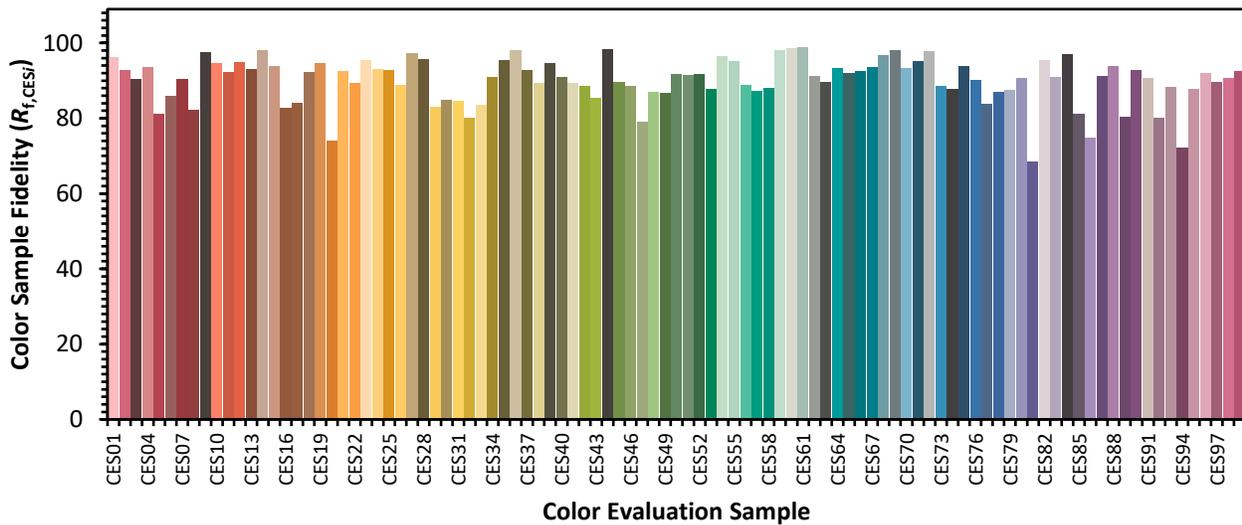


Color Vector Graphics

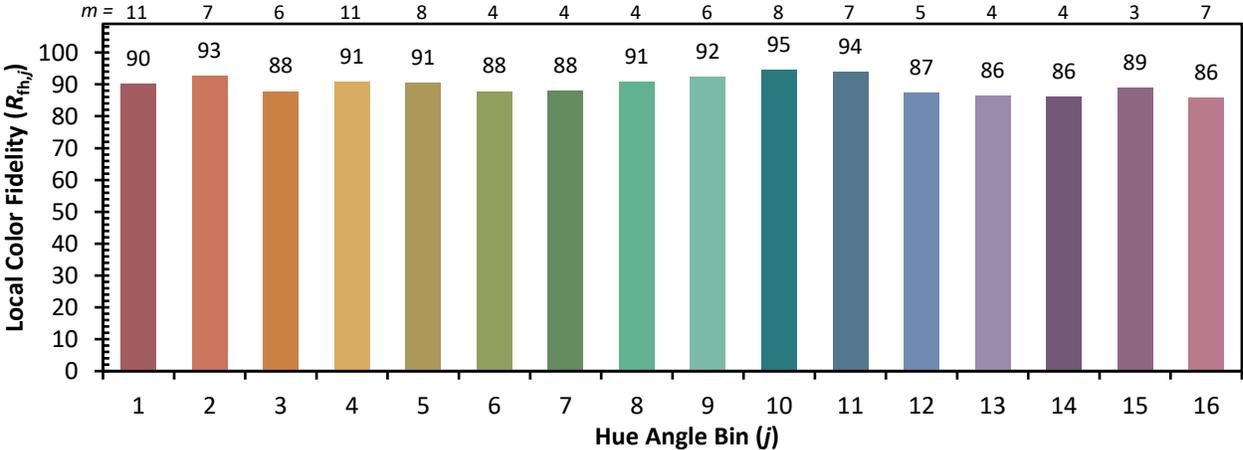


Individual Sample Fidelity Index ($R_{f,i}$)

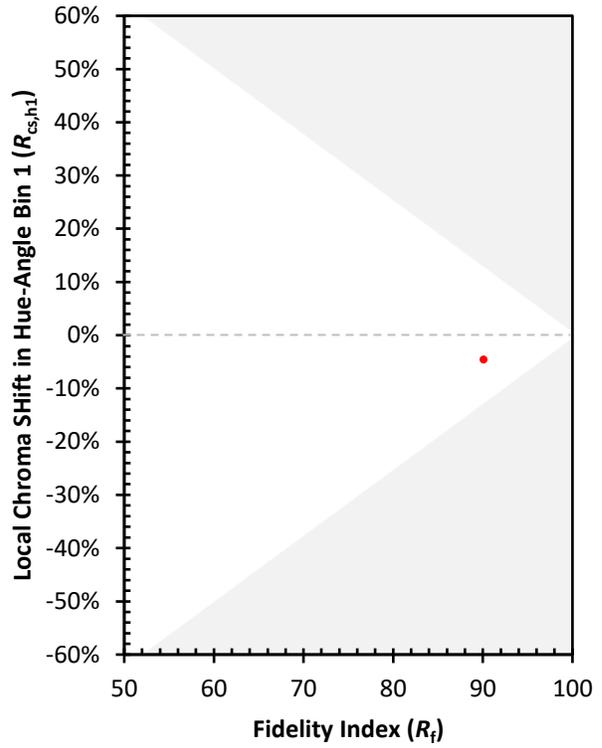
| | | | |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 89 | CES51 = 92 | CES76 = 90 |
| CES02 = 64 | CES27 = 97 | CES52 = 92 | CES77 = 84 |
| CES03 = 32 | CES28 = 96 | CES53 = 88 | CES78 = 87 |
| CES04 = 71 | CES29 = 83 | CES54 = 97 | CES79 = 88 |
| CES05 = 51 | CES30 = 85 | CES55 = 95 | CES80 = 91 |
| CES06 = 51 | CES31 = 85 | CES56 = 89 | CES81 = 69 |
| CES07 = 44 | CES32 = 80 | CES57 = 87 | CES82 = 95 |
| CES08 = 43 | CES33 = 84 | CES58 = 88 | CES83 = 91 |
| CES09 = 29 | CES34 = 91 | CES59 = 98 | CES84 = 97 |
| CES10 = 77 | CES35 = 96 | CES60 = 99 | CES85 = 81 |
| CES11 = 59 | CES36 = 98 | CES61 = 99 | CES86 = 75 |
| CES12 = 66 | CES37 = 93 | CES62 = 91 | CES87 = 91 |
| CES13 = 45 | CES38 = 89 | CES63 = 90 | CES88 = 94 |
| CES14 = 74 | CES39 = 95 | CES64 = 93 | CES89 = 80 |
| CES15 = 72 | CES40 = 91 | CES65 = 92 | CES90 = 93 |
| CES16 = 48 | CES41 = 89 | CES66 = 92 | CES91 = 91 |
| CES17 = 50 | CES42 = 89 | CES67 = 93 | CES92 = 80 |
| CES18 = 57 | CES43 = 85 | CES68 = 97 | CES93 = 88 |
| CES19 = 72 | CES44 = 98 | CES69 = 98 | CES94 = 72 |
| CES20 = 68 | CES45 = 90 | CES70 = 93 | CES95 = 88 |
| CES21 = 87 | CES46 = 89 | CES71 = 95 | CES96 = 92 |
| CES22 = 79 | CES47 = 79 | CES72 = 98 | CES97 = 90 |
| CES23 = 92 | CES48 = 87 | CES73 = 89 | CES98 = 91 |
| CES24 = 91 | CES49 = 87 | CES74 = 88 | CES99 = 92 |
| CES25 = 72 | CES50 = 92 | CES75 = 94 | |



Color Rendition by Hue-Angle Bin



Measure Comparisons



(END OF REPORT)