

Signify Classified - Internal  
Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
Peachtree City, GA 30269



Scaled data based on original data using  
LM-79-08 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions  
(formerly Eaton)

Brand: INVUE

Report Number: P871284

Luminaire Tested: **EMM2-HSN-SA3A-830-U-T4W-HSS**

Issue Date: 09/05/2024



**Test Information**

Test Method: LM-79-08  
Report Number: P871284  
Test Lab: INNOVATION CENTER(G3)  
Issue Date: 09/05/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: INVUE  
Catalog Number: EMM2-HSN-SA3A-830-U-T4W-HSS  
Description: EPIC MODERN SHORT HOUSING DISCRETE LED ARRAYS 130W 80CRI 3000K  
FIXTURE w/ TYPE IV WIDE DISTRIBUTION OPTIC AND HOUSE SIDE SHIELD  
Light Source: (30) 3000K CCT, 80 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

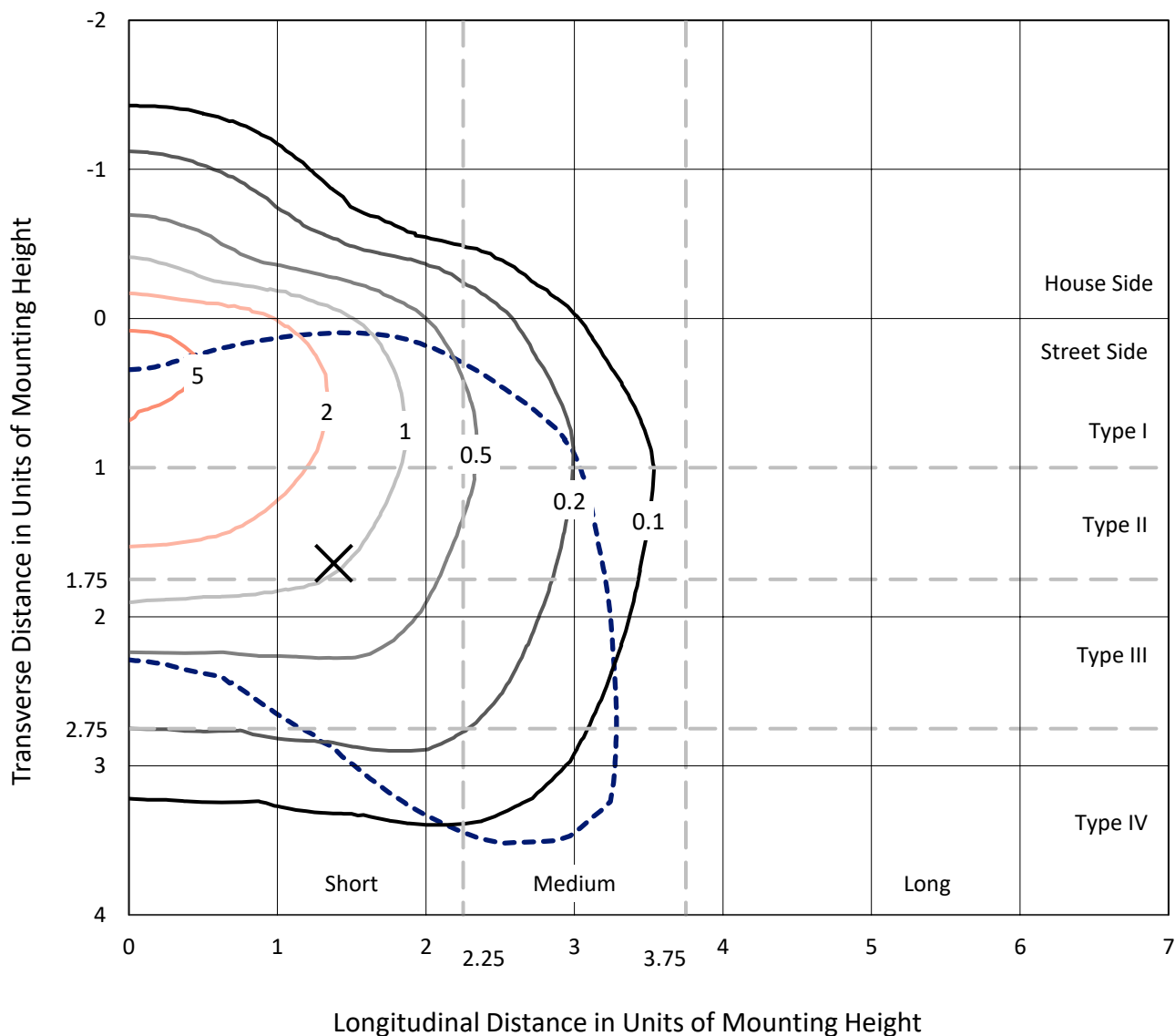
Lumens per Lamp: N/A  
Luminaire Lumens: 10428.3 lumens  
Efficiency: N/A  
Efficacy: 92.3 lumens/watt  
Luminous Opening: Rectangular (W 1' x L: 0.33' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B1 - U0 - G2

Input Watts (W): 113  
Input Voltage (V): 120  
Input Current (A<sub>in</sub>): NR  
Voltage Rise (V): NR  
Power Factor: 0.99  
Total Harmonic Distortion (THDi): 7.77%  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 24 FT

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 CATALOG NUMBER: EMM2-HSN-SA3A-830-U-T4W-HSS

### Iso-Footcandle Lines of Horizontal Illumination

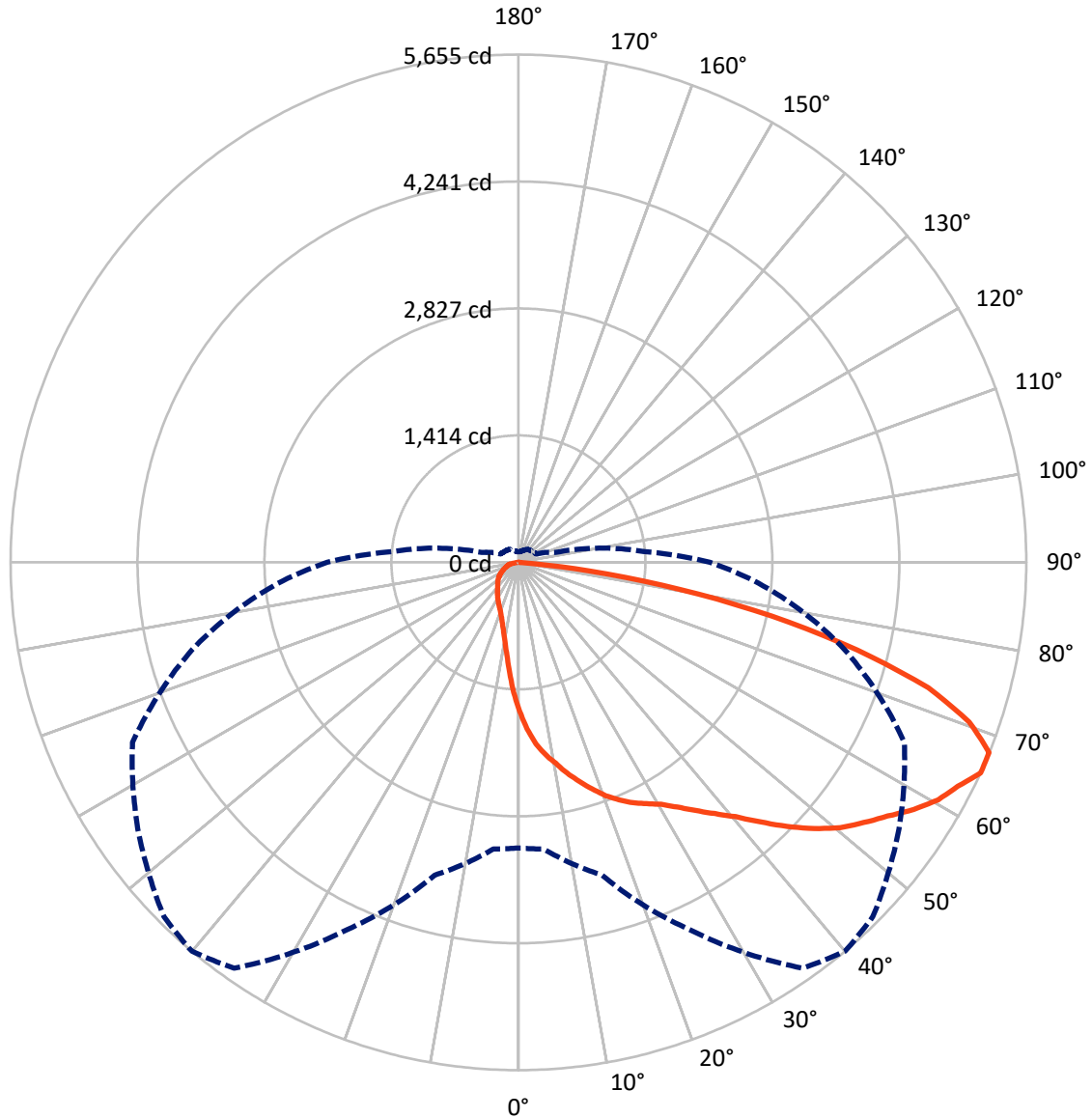
✕ Max cd  
 - - - 1/2 Max cd



Based on 20 foot mounting height. Maximum calculated value = 6 fc  
 Type IV - Short - N/A

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### Luminous Intensity Polar Plot



— Vertical Plane Through 40-Deg Lateral      - - - Horizontal Cone Through 65-Deg Vertical

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**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 1248.5   | 0.0    | 1248.5  |
|                    | % Fixture | 12.0     | 0.0    | 12.0    |
| <b>Street Side</b> | Lumens    | 9179.8   | 0.0    | 9179.8  |
|                    | % Fixture | 88.0     | 0.0    | 88.0    |
| <b>Total</b>       | Lumens    | 10428.3  | 0.0    | 10428.3 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 155.2   | 1.5       |
| 10°-20°   | 466.6   | 4.5       |
| 20°-30°   | 802.6   | 7.7       |
| 30°-40°   | 1213.3  | 11.6      |
| 40°-50°   | 1774.1  | 17.0      |
| 50°-60°   | 2265.9  | 21.7      |
| 60°-70°   | 2261.3  | 21.7      |
| 70°-80°   | 1326.0  | 12.7      |
| 80°-90°   | 163.3   | 1.6       |
| 90°-100°  | 0.0     | 0.0       |
| 100°-110° | 0.0     | 0.0       |
| 110°-120° | 0.0     | 0.0       |
| 120°-130° | 0.0     | 0.0       |
| 130°-140° | 0.0     | 0.0       |
| 140°-150° | 0.0     | 0.0       |
| 150°-160° | 0.0     | 0.0       |
| 160°-170° | 0.0     | 0.0       |
| 170°-180° | 0.0     | 0.0       |
| 0°-90°    | 10428.3 | 100.0     |
| 0°-180°   | 10428.3 | 100.0     |

**Coefficient of Utilization**



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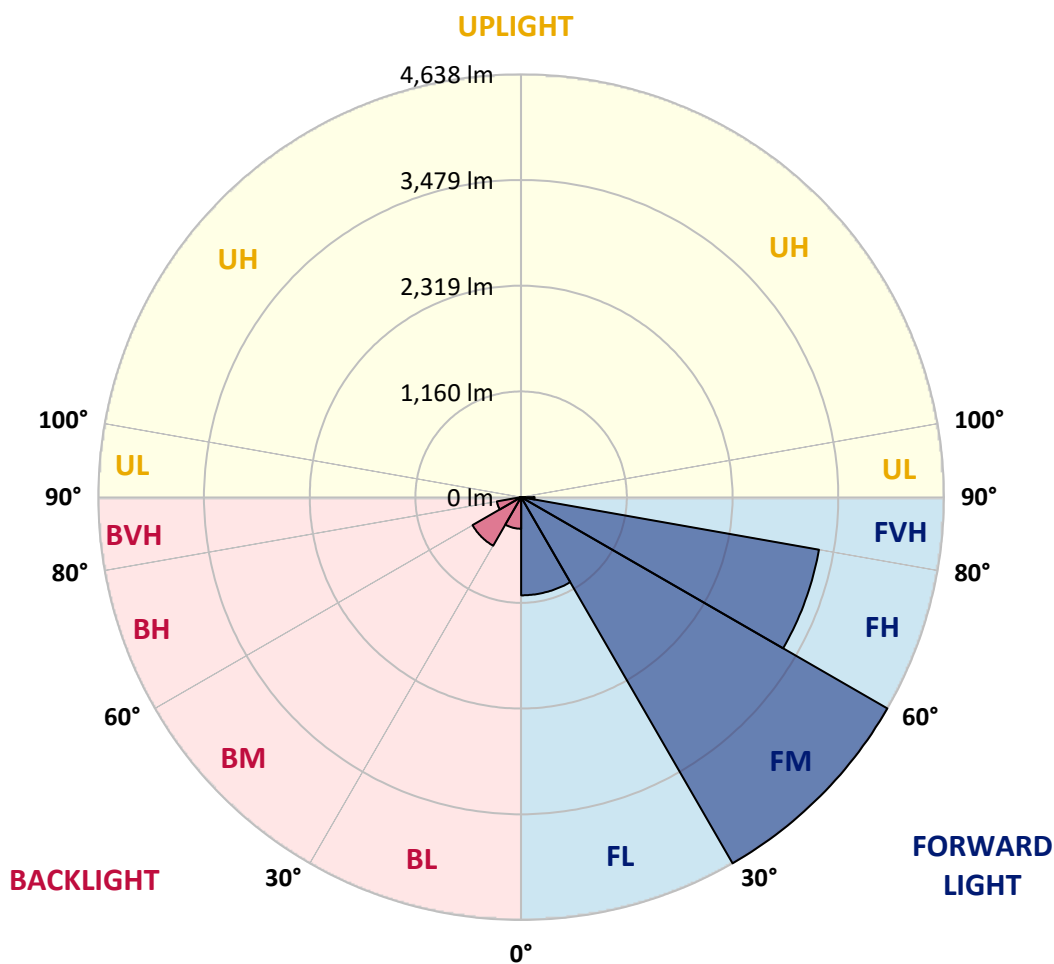
CATALOG NUMBER: EMM2-HSN-SA3A-830-U-T4W-HSS

**LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:**

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 1077.1 | 10.3      |                         |      |         |
| FM   | (30°-60°)   | 4638.0 | 44.5      |                         |      |         |
| FH   | (60°-80°)   | 3317.1 | 31.8      |                         |      | G2/5000 |
| FVH  | (80°-90°)   | 147.6  | 1.4       |                         |      | G2/225  |
| BL   | (0°-30°)    | 347.3  | 3.3       | B1/500                  |      |         |
| BM   | (30°-60°)   | 615.2  | 5.9       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 270.3  | 2.6       | B1/500                  |      | G1/500  |
| BVH  | (80°-90°)   | 15.7   | 0.2       |                         |      | G1/100  |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B1-U0-G2**

Type IV Short





REPORT NUMBER: P871284

CATALOG NUMBER: EMM2-HSN-SA3A-830-U-T4W-HSS

**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 40°    | 45°    | 55°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 |
| 2.5°  | 1933.9 | 1925.1 | 1907.5 | 1892.8 | 1872.2 | 1854.6 | 1836.9 | 1804.6 | 1763.5 | 1728.2 | 1684.1 |
| 5°    | 2125.0 | 2110.3 | 2098.5 | 2080.9 | 2045.6 | 2030.9 | 2019.2 | 1951.6 | 1881.0 | 1807.6 | 1710.6 |
| 7.5°  | 2260.2 | 2271.9 | 2248.4 | 2222.0 | 2177.9 | 2160.2 | 2142.6 | 2075.0 | 1986.8 | 1881.0 | 1742.9 |
| 10°   | 2415.9 | 2418.9 | 2389.5 | 2357.2 | 2310.1 | 2274.9 | 2251.4 | 2169.1 | 2072.1 | 1954.5 | 1778.2 |
| 12.5° | 2565.8 | 2565.8 | 2548.2 | 2501.2 | 2439.5 | 2407.1 | 2366.0 | 2271.9 | 2154.4 | 2016.2 | 1819.3 |
| 15°   | 2686.3 | 2692.2 | 2677.5 | 2642.3 | 2574.7 | 2530.6 | 2489.4 | 2380.7 | 2230.8 | 2086.8 | 1851.6 |
| 17.5° | 2795.1 | 2792.2 | 2783.3 | 2751.0 | 2686.3 | 2651.1 | 2609.9 | 2489.4 | 2319.0 | 2142.6 | 1901.6 |
| 20°   | 2868.6 | 2868.6 | 2865.6 | 2848.0 | 2801.0 | 2774.5 | 2724.6 | 2598.2 | 2415.9 | 2224.9 | 1954.5 |
| 22.5° | 2924.4 | 2921.5 | 2921.5 | 2924.4 | 2898.0 | 2871.5 | 2850.9 | 2724.6 | 2515.9 | 2295.4 | 2007.4 |
| 25°   | 2971.4 | 2968.5 | 2977.3 | 2983.2 | 2971.4 | 2965.6 | 2942.0 | 2845.1 | 2639.3 | 2377.7 | 2060.3 |
| 27.5° | 3033.2 | 3042.0 | 3039.0 | 3039.0 | 3036.1 | 3042.0 | 3039.0 | 2956.7 | 2759.8 | 2465.9 | 2116.2 |
| 30°   | 3130.1 | 3144.8 | 3136.0 | 3124.3 | 3124.3 | 3127.2 | 3141.9 | 3089.0 | 2900.9 | 2574.7 | 2177.9 |
| 32.5° | 3356.5 | 3341.8 | 3280.0 | 3238.9 | 3244.8 | 3247.7 | 3262.4 | 3233.0 | 3042.0 | 2698.1 | 2242.5 |
| 35°   | 3615.1 | 3597.5 | 3529.9 | 3435.8 | 3403.5 | 3391.7 | 3388.8 | 3371.2 | 3194.8 | 2830.4 | 2319.0 |
| 37.5° | 3950.2 | 3956.0 | 3856.1 | 3720.9 | 3623.9 | 3550.4 | 3535.7 | 3497.5 | 3327.1 | 2950.9 | 2398.3 |
| 40°   | 4291.1 | 4267.6 | 4182.3 | 4050.1 | 3859.0 | 3723.8 | 3679.8 | 3626.9 | 3477.0 | 3077.2 | 2474.7 |
| 42.5° | 4620.3 | 4576.2 | 4464.5 | 4320.5 | 4097.1 | 3950.2 | 3850.2 | 3782.6 | 3615.1 | 3215.4 | 2548.2 |
| 45°   | 5049.4 | 4923.0 | 4723.1 | 4593.8 | 4314.6 | 4194.1 | 4103.0 | 3953.1 | 3779.7 | 3353.5 | 2636.4 |
| 47.5° | 5387.4 | 5143.4 | 4961.2 | 4905.4 | 4540.9 | 4429.2 | 4346.9 | 4138.3 | 3947.2 | 3509.3 | 2727.5 |
| 50°   | 5325.7 | 5175.8 | 5131.7 | 5081.7 | 4711.4 | 4643.8 | 4567.4 | 4349.9 | 4117.7 | 3673.9 | 2815.7 |
| 52.5° | 5166.9 | 5184.6 | 5240.4 | 5155.2 | 4861.3 | 4814.3 | 4764.3 | 4576.2 | 4288.2 | 3809.1 | 2895.0 |
| 55°   | 5040.6 | 5075.8 | 5225.7 | 5199.3 | 5040.6 | 4987.7 | 4952.4 | 4799.6 | 4452.7 | 3932.5 | 2962.6 |
| 57.5° | 4811.3 | 4781.9 | 4970.0 | 5275.7 | 5231.6 | 5190.5 | 5155.2 | 5034.7 | 4620.3 | 4020.7 | 3006.7 |
| 60°   | 4449.8 | 4341.1 | 4593.8 | 5181.6 | 5363.9 | 5369.7 | 5349.2 | 5211.0 | 4755.5 | 4020.7 | 2983.2 |
| 62.5° | 3941.3 | 3838.5 | 4150.0 | 4867.2 | 5434.4 | 5490.3 | 5478.5 | 5272.8 | 4814.3 | 3932.5 | 2892.1 |
| 65°   | 3180.1 | 3203.6 | 3606.3 | 4511.5 | 5516.7 | 5654.8 | 5581.4 | 5172.8 | 4740.8 | 3762.1 | 2686.3 |
| 67.5° | 2539.4 | 2609.9 | 2971.4 | 4050.1 | 5478.5 | 5651.9 | 5549.0 | 4890.7 | 4426.3 | 3524.0 | 2371.9 |
| 70°   | 2004.5 | 2051.5 | 2351.3 | 3427.0 | 5143.4 | 5325.7 | 5196.3 | 4458.6 | 3894.3 | 3156.6 | 1972.1 |
| 72.5° | 1566.5 | 1610.6 | 1866.3 | 2742.2 | 4561.5 | 4773.1 | 4611.5 | 3876.7 | 3230.1 | 2677.5 | 1566.5 |
| 75°   | 1190.3 | 1222.7 | 1413.7 | 2113.2 | 3632.7 | 3897.3 | 3779.7 | 3103.7 | 2521.8 | 2119.1 | 1199.2 |
| 77.5° | 767.1  | 811.2  | 1025.7 | 1481.3 | 2565.8 | 2883.3 | 2898.0 | 2319.0 | 1813.4 | 1531.3 | 881.7  |
| 80°   | 508.5  | 526.1  | 658.4  | 964.0  | 1578.3 | 1825.2 | 1910.4 | 1566.5 | 1158.0 | 975.8  | 634.8  |
| 82.5° | 211.6  | 235.1  | 314.5  | 485.0  | 790.6  | 793.6  | 908.2  | 661.3  | 470.3  | 414.4  | 267.5  |
| 85°   | 5.9    | 11.8   | 8.8    | 23.5   | 20.6   | 32.3   | 38.2   | 52.9   | 38.2   | 41.1   | 41.1   |
| 87.5° | 0.0    | 0.0    | 2.9    | 2.9    | 5.9    | 5.9    | 5.9    | 5.9    | 5.9    | 8.8    | 5.9    |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



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CATALOG NUMBER: EMM2-HSN-SA3A-830-U-T4W-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 | 1657.7 |
| 2.5°  | 1663.5 | 1637.1 | 1584.2 | 1543.0 | 1498.9 | 1466.6 | 1437.2 | 1404.9 | 1384.3 | 1387.3 | 1366.7 |
| 5°    | 1663.5 | 1613.6 | 1507.8 | 1413.7 | 1328.5 | 1266.8 | 1199.2 | 1146.3 | 1108.0 | 1102.2 | 1119.8 |
| 7.5°  | 1672.4 | 1590.1 | 1431.3 | 1290.3 | 1172.7 | 1075.7 | 1005.2 | 952.3  | 925.8  | 908.2  | 905.2  |
| 10°   | 1681.2 | 1572.4 | 1360.8 | 1181.5 | 1034.6 | 928.8  | 867.0  | 808.3  | 778.9  | 775.9  | 767.1  |
| 12.5° | 1687.0 | 1551.8 | 1296.1 | 1072.8 | 919.9  | 820.0  | 758.3  | 711.3  | 687.8  | 687.8  | 684.8  |
| 15°   | 1707.6 | 1546.0 | 1228.5 | 990.5  | 831.8  | 734.8  | 681.9  | 643.7  | 629.0  | 620.2  | 617.2  |
| 17.5° | 1725.3 | 1534.2 | 1169.8 | 908.2  | 752.4  | 667.2  | 617.2  | 590.8  | 576.1  | 570.2  | 567.2  |
| 20°   | 1751.7 | 1528.3 | 1113.9 | 840.6  | 693.6  | 611.3  | 573.1  | 549.6  | 540.8  | 534.9  | 534.9  |
| 22.5° | 1778.2 | 1522.5 | 1058.1 | 781.8  | 643.7  | 570.2  | 534.9  | 514.3  | 505.5  | 502.6  | 499.6  |
| 25°   | 1810.5 | 1519.5 | 1011.1 | 731.8  | 599.6  | 537.9  | 505.5  | 487.9  | 476.1  | 470.3  | 470.3  |
| 27.5° | 1842.8 | 1522.5 | 964.0  | 681.9  | 561.4  | 508.5  | 476.1  | 455.6  | 446.7  | 435.0  | 437.9  |
| 30°   | 1886.9 | 1525.4 | 925.8  | 640.7  | 529.0  | 479.1  | 449.7  | 423.2  | 411.5  | 405.6  | 405.6  |
| 32.5° | 1931.0 | 1537.2 | 887.6  | 602.5  | 496.7  | 455.6  | 420.3  | 396.8  | 382.1  | 379.1  | 376.2  |
| 35°   | 1978.0 | 1546.0 | 852.3  | 570.2  | 470.3  | 429.1  | 393.8  | 370.3  | 358.6  | 355.6  | 355.6  |
| 37.5° | 2030.9 | 1560.7 | 825.9  | 540.8  | 443.8  | 402.7  | 370.3  | 346.8  | 338.0  | 335.1  | 335.1  |
| 40°   | 2086.8 | 1584.2 | 805.3  | 514.3  | 423.2  | 379.1  | 349.8  | 329.2  | 323.3  | 320.4  | 320.4  |
| 42.5° | 2142.6 | 1604.8 | 787.7  | 493.8  | 402.7  | 358.6  | 335.1  | 314.5  | 305.7  | 305.7  | 305.7  |
| 45°   | 2195.5 | 1619.4 | 770.0  | 473.2  | 382.1  | 343.9  | 317.4  | 299.8  | 291.0  | 291.0  | 291.0  |
| 47.5° | 2242.5 | 1634.1 | 743.6  | 452.6  | 361.5  | 323.3  | 302.7  | 285.1  | 276.3  | 276.3  | 276.3  |
| 50°   | 2292.5 | 1643.0 | 714.2  | 426.2  | 340.9  | 308.6  | 288.0  | 267.5  | 261.6  | 258.6  | 258.6  |
| 52.5° | 2333.7 | 1643.0 | 676.0  | 399.7  | 317.4  | 288.0  | 270.4  | 252.8  | 243.9  | 238.1  | 238.1  |
| 55°   | 2363.0 | 1643.0 | 634.8  | 367.4  | 293.9  | 270.4  | 252.8  | 235.1  | 223.4  | 214.6  | 214.6  |
| 57.5° | 2380.7 | 1634.1 | 587.8  | 329.2  | 270.4  | 246.9  | 235.1  | 214.6  | 191.0  | 173.4  | 167.5  |
| 60°   | 2366.0 | 1607.7 | 537.9  | 288.0  | 243.9  | 226.3  | 217.5  | 191.0  | 158.7  | 149.9  | 149.9  |
| 62.5° | 2304.3 | 1546.0 | 487.9  | 252.8  | 223.4  | 205.7  | 196.9  | 167.5  | 144.0  | 135.2  | 135.2  |
| 65°   | 2130.9 | 1396.1 | 426.2  | 220.4  | 199.9  | 188.1  | 176.3  | 149.9  | 129.3  | 117.6  | 117.6  |
| 67.5° | 1878.1 | 1205.0 | 355.6  | 194.0  | 179.3  | 170.5  | 161.7  | 135.2  | 114.6  | 102.9  | 102.9  |
| 70°   | 1522.5 | 972.8  | 302.7  | 170.5  | 158.7  | 152.8  | 144.0  | 123.4  | 99.9   | 91.1   | 91.1   |
| 72.5° | 1196.2 | 764.2  | 252.8  | 152.8  | 147.0  | 135.2  | 129.3  | 108.7  | 91.1   | 82.3   | 82.3   |
| 75°   | 890.5  | 570.2  | 223.4  | 135.2  | 135.2  | 120.5  | 117.6  | 97.0   | 79.4   | 73.5   | 73.5   |
| 77.5° | 655.4  | 423.2  | 194.0  | 117.6  | 117.6  | 105.8  | 99.9   | 85.2   | 73.5   | 67.6   | 67.6   |
| 80°   | 443.8  | 288.0  | 144.0  | 88.2   | 88.2   | 85.2   | 79.4   | 73.5   | 61.7   | 55.8   | 52.9   |
| 82.5° | 188.1  | 120.5  | 70.5   | 44.1   | 41.1   | 32.3   | 26.5   | 20.6   | 20.6   | 17.6   | 17.6   |
| 85°   | 32.3   | 14.7   | 14.7   | 11.8   | 8.8    | 8.8    | 8.8    | 5.9    | 5.9    | 5.9    | 5.9    |
| 87.5° | 5.9    | 5.9    | 5.9    | 5.9    | 5.9    | 5.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



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

Streetworks

Report Number: SP1-2407-157-7

Test Date: 09/05/2024

Luminaire Tested: MEM2-HTN-SA-40-830-U-5WQ

Data in this report applies to families of products including MEM2-HTN-SA-40-830-U-5WQ

**Test Information**

Test Method: LM-79-2019  
 Report Number: SP1-2407-157-7  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry: 4π  
 Issue Date: 09/05/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: Streetworks  
 Catalog Number: **MEM2-HTN-SA-40-830-U-5WQ**  
 Description: Epic Modern Light Square 40W 5WQ Optic

**Spectral Parameters**

CCT (K): 3126  
 CIE u': 0.2465  
 CIE v': 0.5182  
 Duv: -0.0004  
 CIE x: 0.4277  
 CIE y: 0.3997  
 CIE z: 0.1727  
 Peak Wavelength (nm): 601  
 Dominant Wavelength (nm): 582  
 Purity: 48.31913  
 Rf: 84.4  
 Rg: 94.7

|           |      |      |      |
|-----------|------|------|------|
| CRI (Ra): | 82.6 |      |      |
| R1:       | 81.4 | R9:  | 5.1  |
| R2:       | 92.2 | R10: | 82.2 |
| R3:       | 94.9 | R11: | 79.8 |
| R4:       | 80.1 | R12: | 70.4 |
| R5:       | 81.8 | R13: | 84.2 |
| R6:       | 90.5 | R14: | 97.9 |
| R7:       | 81.8 | R15: | 73.6 |
| R8:       | 58.0 |      |      |



**Test Conditions**

Stabilization Time: 22M  
 Operation Time: 1H 22M  
 Sphere Temperature (°C): 24.3

REPORT NUMBER: SP1-2407-157-7

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 6/18/2024        | 12/18/2024           |
| Power Meter                    | INXT2011004           | 2/8/2024         | 2/8/2025             |
| AC Power Source                | IN0063                | 10/24/2023       | 10/24/2024           |
| DC Power Source                | IN0208                | 10/24/2023       | 10/24/2024           |
| Sphere Thermometer             | IN0085                | 10/24/2023       | 10/24/2024           |
| Room Thermometer               | IN0046                | 10/24/2023       | 10/24/2024           |

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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 3000K 4-step quadrangle

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**Photopic Flux vs. Wavelength**



**Photopic Lumens: NR**

| $\lambda$<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>( $\phi$ /nm) | $\lambda$<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>( $\phi$ /nm) | $\lambda$<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>( $\phi$ /nm) | $\lambda$<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>( $\phi$ /nm) | $\lambda$<br>(nm) | Power<br>W <sup>^</sup> /nm | Lumens<br>( $\phi$ /nm) |
|-------------------|-----------------------------|-------------------------|-------------------|-----------------------------|-------------------------|-------------------|-----------------------------|-------------------------|-------------------|-----------------------------|-------------------------|-------------------|-----------------------------|-------------------------|
| 360               | 0                           | NR                      | 490               | 258                         | NR                      | 620               | 908                         | NR                      | 750               | 26                          | NR                      | 880               | 1                           | NR                      |
| 365               | 0                           | NR                      | 495               | 297                         | NR                      | 625               | 857                         | NR                      | 755               | 22                          | NR                      | 885               | 0                           | NR                      |
| 370               | 0                           | NR                      | 500               | 345                         | NR                      | 630               | 801                         | NR                      | 760               | 19                          | NR                      | 890               | 0                           | NR                      |
| 375               | 0                           | NR                      | 505               | 391                         | NR                      | 635               | 738                         | NR                      | 765               | 16                          | NR                      | 895               | 0                           | NR                      |
| 380               | 0                           | NR                      | 510               | 426                         | NR                      | 640               | 675                         | NR                      | 770               | 14                          | NR                      | 900               | 0                           | NR                      |
| 385               | 0                           | NR                      | 515               | 456                         | NR                      | 645               | 610                         | NR                      | 775               | 12                          | NR                      | 905               | 0                           | NR                      |
| 390               | 0                           | NR                      | 520               | 480                         | NR                      | 650               | 547                         | NR                      | 780               | 10                          | NR                      | 910               | 0                           | NR                      |
| 395               | 0                           | NR                      | 525               | 500                         | NR                      | 655               | 488                         | NR                      | 785               | 9                           | NR                      | 915               | 0                           | NR                      |
| 400               | 0                           | NR                      | 530               | 517                         | NR                      | 660               | 429                         | NR                      | 790               | 7                           | NR                      | 920               | 0                           | NR                      |
| 405               | 2                           | NR                      | 535               | 538                         | NR                      | 665               | 378                         | NR                      | 795               | 6                           | NR                      | 925               | 0                           | NR                      |
| 410               | 4                           | NR                      | 540               | 558                         | NR                      | 670               | 328                         | NR                      | 800               | 5                           | NR                      | 930               | 0                           | NR                      |
| 415               | 9                           | NR                      | 545               | 584                         | NR                      | 675               | 285                         | NR                      | 805               | 5                           | NR                      | 935               | 0                           | NR                      |
| 420               | 16                          | NR                      | 550               | 611                         | NR                      | 680               | 247                         | NR                      | 810               | 4                           | NR                      | 940               | 0                           | NR                      |
| 425               | 31                          | NR                      | 555               | 646                         | NR                      | 685               | 212                         | NR                      | 815               | 3                           | NR                      | 945               | 0                           | NR                      |
| 430               | 56                          | NR                      | 560               | 687                         | NR                      | 690               | 183                         | NR                      | 820               | 3                           | NR                      | 950               | 0                           | NR                      |
| 435               | 101                         | NR                      | 565               | 731                         | NR                      | 695               | 156                         | NR                      | 825               | 3                           | NR                      | 955               | 0                           | NR                      |
| 440               | 178                         | NR                      | 570               | 780                         | NR                      | 700               | 133                         | NR                      | 830               | 2                           | NR                      | 960               | 0                           | NR                      |
| 445               | 323                         | NR                      | 575               | 832                         | NR                      | 705               | 114                         | NR                      | 835               | 2                           | NR                      | 965               | 0                           | NR                      |
| 450               | 566                         | NR                      | 580               | 883                         | NR                      | 710               | 96                          | NR                      | 840               | 2                           | NR                      | 970               | 0                           | NR                      |
| 455               | 645                         | NR                      | 585               | 927                         | NR                      | 715               | 82                          | NR                      | 845               | 1                           | NR                      | 975               | 0                           | NR                      |
| 460               | 457                         | NR                      | 590               | 963                         | NR                      | 720               | 70                          | NR                      | 850               | 1                           | NR                      | 980               | 0                           | NR                      |
| 465               | 365                         | NR                      | 595               | 985                         | NR                      | 725               | 59                          | NR                      | 855               | 1                           | NR                      | 985               | 0                           | NR                      |
| 470               | 317                         | NR                      | 600               | 998                         | NR                      | 730               | 50                          | NR                      | 860               | 1                           | NR                      | 990               | 0                           | NR                      |
| 475               | 244                         | NR                      | 605               | 994                         | NR                      | 735               | 43                          | NR                      | 865               | 1                           | NR                      | 995               | 0                           | NR                      |
| 480               | 218                         | NR                      | 610               | 978                         | NR                      | 740               | 36                          | NR                      | 870               | 1                           | NR                      | 1000              | 0                           | NR                      |
| 485               | 233                         | NR                      | 615               | 947                         | NR                      | 745               | 31                          | NR                      | 875               | 1                           | NR                      |                   |                             |                         |

REPORT NUMBER: SP1-2407-157-7

Scotopic Flux vs. Wavelength



Scotopic Lumens: NR S/P: 1.42

| λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 258                      | NR            | 620    | 908                      | NR            | 750    | 26                       | NR            | 880    | 1                        | NR            |
| 365    | 0                        | NR            | 495    | 297                      | NR            | 625    | 857                      | NR            | 755    | 22                       | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 345                      | NR            | 630    | 801                      | NR            | 760    | 19                       | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 391                      | NR            | 635    | 738                      | NR            | 765    | 16                       | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 426                      | NR            | 640    | 675                      | NR            | 770    | 14                       | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 456                      | NR            | 645    | 610                      | NR            | 775    | 12                       | NR            | 905    | 0                        | NR            |
| 390    | 0                        | NR            | 520    | 480                      | NR            | 650    | 547                      | NR            | 780    | 10                       | NR            | 910    | 0                        | NR            |
| 395    | 0                        | NR            | 525    | 500                      | NR            | 655    | 488                      | NR            | 785    | 9                        | NR            | 915    | 0                        | NR            |
| 400    | 0                        | NR            | 530    | 517                      | NR            | 660    | 429                      | NR            | 790    | 7                        | NR            | 920    | 0                        | NR            |
| 405    | 2                        | NR            | 535    | 538                      | NR            | 665    | 378                      | NR            | 795    | 6                        | NR            | 925    | 0                        | NR            |
| 410    | 4                        | NR            | 540    | 558                      | NR            | 670    | 328                      | NR            | 800    | 5                        | NR            | 930    | 0                        | NR            |
| 415    | 9                        | NR            | 545    | 584                      | NR            | 675    | 285                      | NR            | 805    | 5                        | NR            | 935    | 0                        | NR            |
| 420    | 16                       | NR            | 550    | 611                      | NR            | 680    | 247                      | NR            | 810    | 4                        | NR            | 940    | 0                        | NR            |
| 425    | 31                       | NR            | 555    | 646                      | NR            | 685    | 212                      | NR            | 815    | 3                        | NR            | 945    | 0                        | NR            |
| 430    | 56                       | NR            | 560    | 687                      | NR            | 690    | 183                      | NR            | 820    | 3                        | NR            | 950    | 0                        | NR            |
| 435    | 101                      | NR            | 565    | 731                      | NR            | 695    | 156                      | NR            | 825    | 3                        | NR            | 955    | 0                        | NR            |
| 440    | 178                      | NR            | 570    | 780                      | NR            | 700    | 133                      | NR            | 830    | 2                        | NR            | 960    | 0                        | NR            |
| 445    | 323                      | NR            | 575    | 832                      | NR            | 705    | 114                      | NR            | 835    | 2                        | NR            | 965    | 0                        | NR            |
| 450    | 566                      | NR            | 580    | 883                      | NR            | 710    | 96                       | NR            | 840    | 2                        | NR            | 970    | 0                        | NR            |
| 455    | 645                      | NR            | 585    | 927                      | NR            | 715    | 82                       | NR            | 845    | 1                        | NR            | 975    | 0                        | NR            |
| 460    | 457                      | NR            | 590    | 963                      | NR            | 720    | 70                       | NR            | 850    | 1                        | NR            | 980    | 0                        | NR            |
| 465    | 365                      | NR            | 595    | 985                      | NR            | 725    | 59                       | NR            | 855    | 1                        | NR            | 985    | 0                        | NR            |
| 470    | 317                      | NR            | 600    | 998                      | NR            | 730    | 50                       | NR            | 860    | 1                        | NR            | 990    | 0                        | NR            |
| 475    | 244                      | NR            | 605    | 994                      | NR            | 735    | 43                       | NR            | 865    | 1                        | NR            | 995    | 0                        | NR            |
| 480    | 218                      | NR            | 610    | 978                      | NR            | 740    | 36                       | NR            | 870    | 1                        | NR            | 1000   | 0                        | NR            |
| 485    | 233                      | NR            | 615    | 947                      | NR            | 745    | 31                       | NR            | 875    | 1                        | NR            |        |                          |               |

REPORT NUMBER: SP1-2407-157-7

Melanopic Flux vs. Wavelength



Melanopic Lumens: NR

M/P: 2.79

| λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 258                      | NR            | 620    | 908                      | NR            | 750    | 26                       | NR            | 880    | 1                        | NR            |
| 365    | 0                        | NR            | 495    | 297                      | NR            | 625    | 857                      | NR            | 755    | 22                       | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 345                      | NR            | 630    | 801                      | NR            | 760    | 19                       | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 391                      | NR            | 635    | 738                      | NR            | 765    | 16                       | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 426                      | NR            | 640    | 675                      | NR            | 770    | 14                       | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 456                      | NR            | 645    | 610                      | NR            | 775    | 12                       | NR            | 905    | 0                        | NR            |
| 390    | 0                        | NR            | 520    | 480                      | NR            | 650    | 547                      | NR            | 780    | 10                       | NR            | 910    | 0                        | NR            |
| 395    | 0                        | NR            | 525    | 500                      | NR            | 655    | 488                      | NR            | 785    | 9                        | NR            | 915    | 0                        | NR            |
| 400    | 0                        | NR            | 530    | 517                      | NR            | 660    | 429                      | NR            | 790    | 7                        | NR            | 920    | 0                        | NR            |
| 405    | 2                        | NR            | 535    | 538                      | NR            | 665    | 378                      | NR            | 795    | 6                        | NR            | 925    | 0                        | NR            |
| 410    | 4                        | NR            | 540    | 558                      | NR            | 670    | 328                      | NR            | 800    | 5                        | NR            | 930    | 0                        | NR            |
| 415    | 9                        | NR            | 545    | 584                      | NR            | 675    | 285                      | NR            | 805    | 5                        | NR            | 935    | 0                        | NR            |
| 420    | 16                       | NR            | 550    | 611                      | NR            | 680    | 247                      | NR            | 810    | 4                        | NR            | 940    | 0                        | NR            |
| 425    | 31                       | NR            | 555    | 646                      | NR            | 685    | 212                      | NR            | 815    | 3                        | NR            | 945    | 0                        | NR            |
| 430    | 56                       | NR            | 560    | 687                      | NR            | 690    | 183                      | NR            | 820    | 3                        | NR            | 950    | 0                        | NR            |
| 435    | 101                      | NR            | 565    | 731                      | NR            | 695    | 156                      | NR            | 825    | 3                        | NR            | 955    | 0                        | NR            |
| 440    | 178                      | NR            | 570    | 780                      | NR            | 700    | 133                      | NR            | 830    | 2                        | NR            | 960    | 0                        | NR            |
| 445    | 323                      | NR            | 575    | 832                      | NR            | 705    | 114                      | NR            | 835    | 2                        | NR            | 965    | 0                        | NR            |
| 450    | 566                      | NR            | 580    | 883                      | NR            | 710    | 96                       | NR            | 840    | 2                        | NR            | 970    | 0                        | NR            |
| 455    | 645                      | NR            | 585    | 927                      | NR            | 715    | 82                       | NR            | 845    | 1                        | NR            | 975    | 0                        | NR            |
| 460    | 457                      | NR            | 590    | 963                      | NR            | 720    | 70                       | NR            | 850    | 1                        | NR            | 980    | 0                        | NR            |
| 465    | 365                      | NR            | 595    | 985                      | NR            | 725    | 59                       | NR            | 855    | 1                        | NR            | 985    | 0                        | NR            |
| 470    | 317                      | NR            | 600    | 998                      | NR            | 730    | 50                       | NR            | 860    | 1                        | NR            | 990    | 0                        | NR            |
| 475    | 244                      | NR            | 605    | 994                      | NR            | 735    | 43                       | NR            | 865    | 1                        | NR            | 995    | 0                        | NR            |
| 480    | 218                      | NR            | 610    | 978                      | NR            | 740    | 36                       | NR            | 870    | 1                        | NR            | 1000   | 0                        | NR            |
| 485    | 233                      | NR            | 615    | 947                      | NR            | 745    | 31                       | NR            | 875    | 1                        | NR            |        |                          |               |

**Summary**

$R_f = 84.4$   
 $R_g = 94.7$   
 $CIE R_a = 82.6$   
 $R_9 = 5.1$



**Color Vector Graphics**



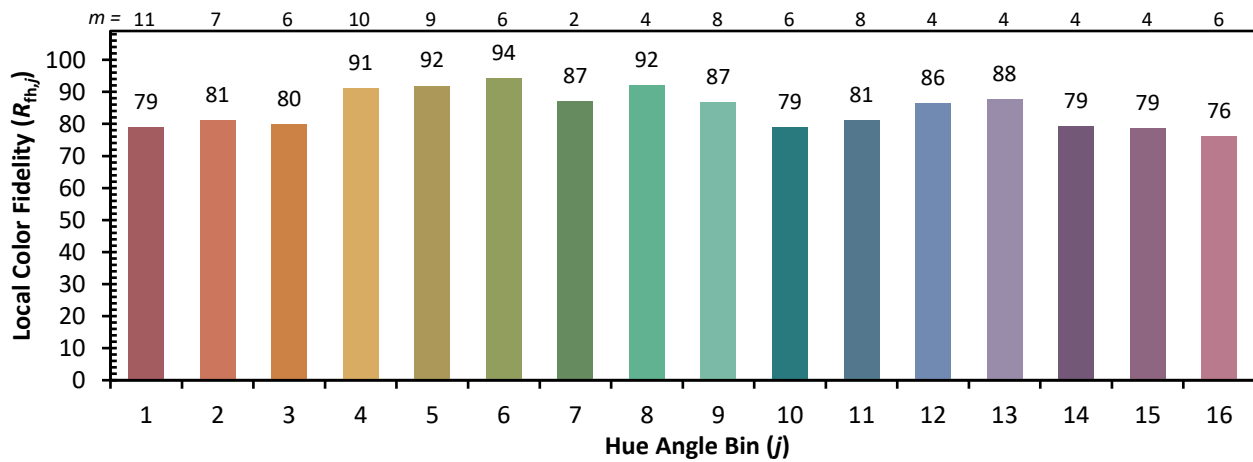


Individual Sample Fidelity Index ( $R_{f,i}$ )

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 86 | CES51 = 93 | CES76 = 82 |
| CES02 = 63 | CES27 = 92 | CES52 = 93 | CES77 = 84 |
| CES03 = 31 | CES28 = 94 | CES53 = 89 | CES78 = 81 |
| CES04 = 70 | CES29 = 92 | CES54 = 89 | CES79 = 90 |
| CES05 = 49 | CES30 = 91 | CES55 = 86 | CES80 = 89 |
| CES06 = 51 | CES31 = 93 | CES56 = 85 | CES81 = 72 |
| CES07 = 42 | CES32 = 85 | CES57 = 83 | CES82 = 95 |
| CES08 = 41 | CES33 = 97 | CES58 = 84 | CES83 = 94 |
| CES09 = 29 | CES34 = 92 | CES59 = 91 | CES84 = 91 |
| CES10 = 76 | CES35 = 96 | CES60 = 90 | CES85 = 74 |
| CES11 = 59 | CES36 = 81 | CES61 = 87 | CES86 = 68 |
| CES12 = 65 | CES37 = 96 | CES62 = 83 | CES87 = 84 |
| CES13 = 43 | CES38 = 86 | CES63 = 87 | CES88 = 88 |
| CES14 = 74 | CES39 = 98 | CES64 = 79 | CES89 = 75 |
| CES15 = 71 | CES40 = 96 | CES65 = 78 | CES90 = 89 |
| CES16 = 47 | CES41 = 96 | CES66 = 77 | CES91 = 73 |
| CES17 = 50 | CES42 = 97 | CES67 = 76 | CES92 = 63 |
| CES18 = 56 | CES43 = 91 | CES68 = 80 | CES93 = 77 |
| CES19 = 72 | CES44 = 99 | CES69 = 85 | CES94 = 61 |
| CES20 = 66 | CES45 = 93 | CES70 = 78 | CES95 = 73 |
| CES21 = 87 | CES46 = 90 | CES71 = 74 | CES96 = 84 |
| CES22 = 79 | CES47 = 94 | CES72 = 91 | CES97 = 88 |
| CES23 = 92 | CES48 = 83 | CES73 = 74 | CES98 = 85 |
| CES24 = 91 | CES49 = 91 | CES74 = 90 | CES99 = 76 |
| CES25 = 72 | CES50 = 93 | CES75 = 78 |            |



Color Rendition by Hue-Angle Bin



Measure Comparisons



(END OF REPORT)