

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: P880245

Luminaire Tested: **EMM2-HTN-VA2-830-U-WT4**

Issue Date: 10/01/2024



**Test Information**

Test Method: LM-79-08  
Report Number: P880245  
Test Lab: INNOVATION CENTER(G3)  
Issue Date: 10/01/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: INVUE  
Catalog Number: EMM2-HTN-VA2-830-U-WT4  
Description: EPIC MODERN TALL HOUSING 2W 80CRI 3000K VISUAL COMFORT FIXTURE w/  
DRIVE LANE TYPE IV DISTRIBUTION OPTIC  
Light Source: (1) 3000K CCT, 80 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

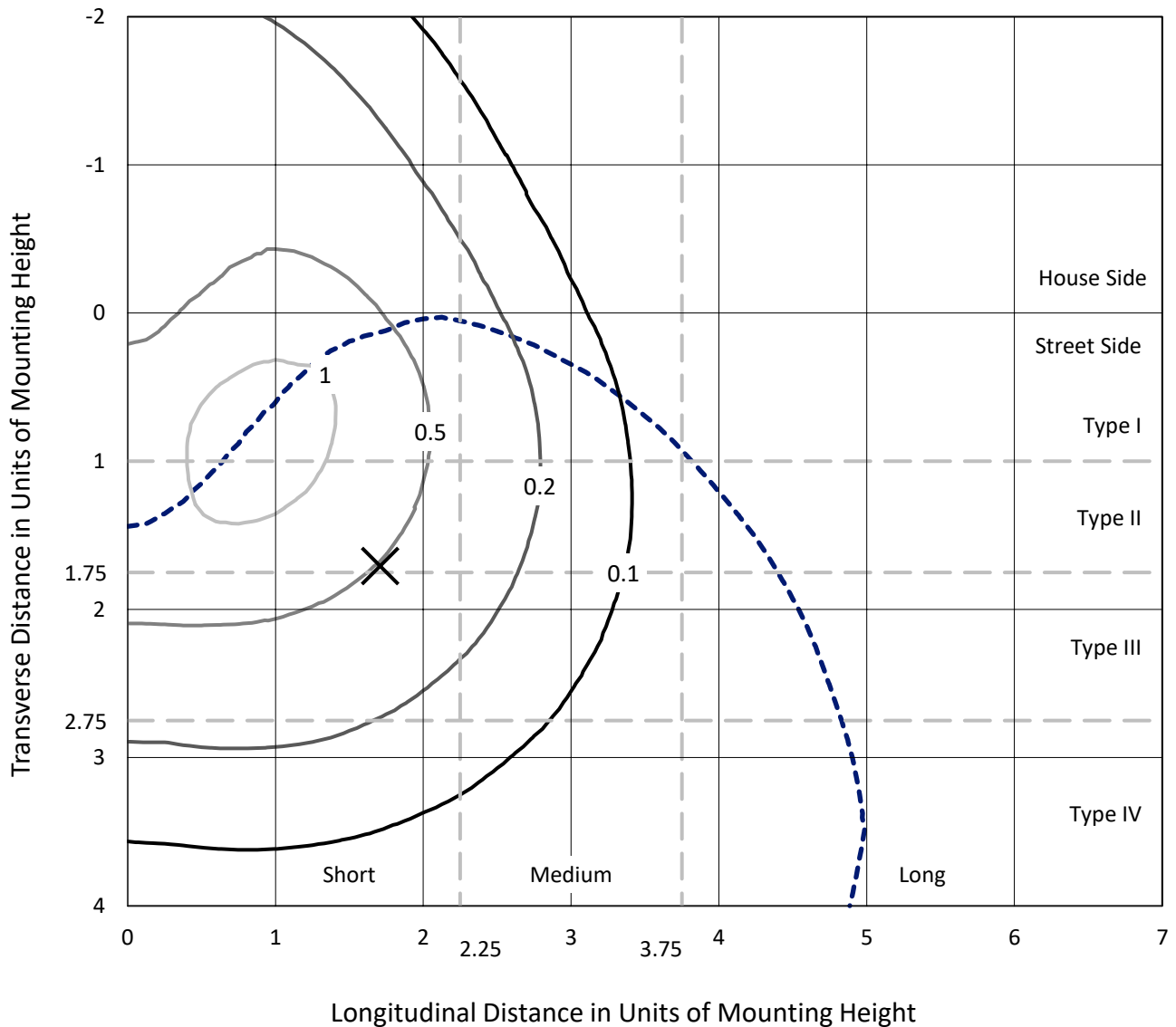
**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 3790.5 lumens  
Efficiency: N/A  
Efficacy: 98.2 lumens/watt  
Luminous Opening: Circular (Dia: 1.12' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B2 - U0 - G3  
  
Input Watts (W): 38.6  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: 0.99  
Total Harmonic Distortion (THDi): 7%  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 24 FT

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 CATALOG NUMBER: EMM2-HTN-VA2-830-U-WT4

### Iso-Footcandle Lines of Horizontal Illumination

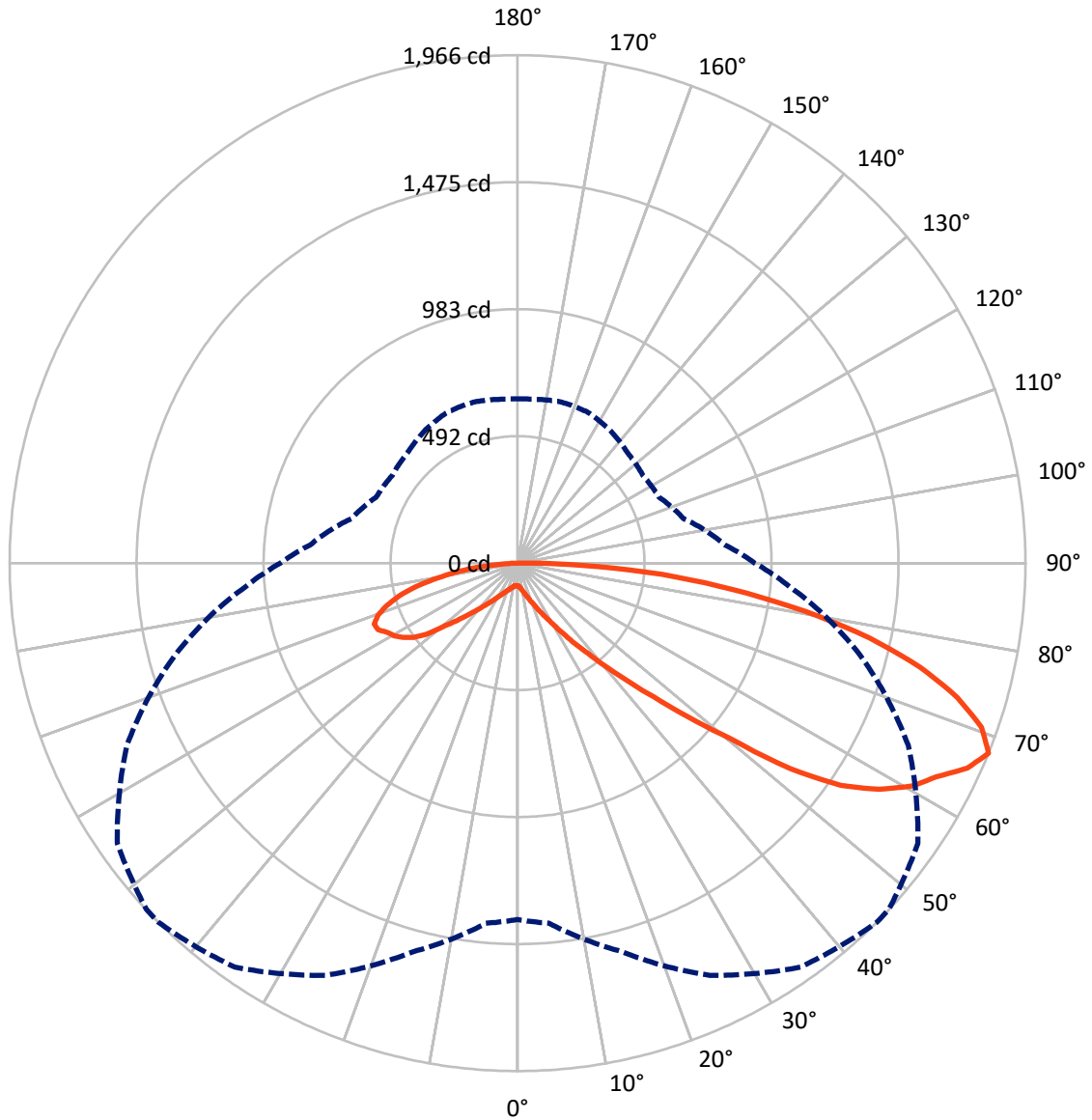
× Max cd  
 - - - 1/2 Max cd



Based on 15 foot mounting height. Maximum calculated value = 1.3 fc  
 Type IV - Short - N/A

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### Luminous Intensity Polar Plot



— Vertical Plane Through 45-Deg Lateral      - - - Horizontal Cone Through 67.5-Deg Vertical

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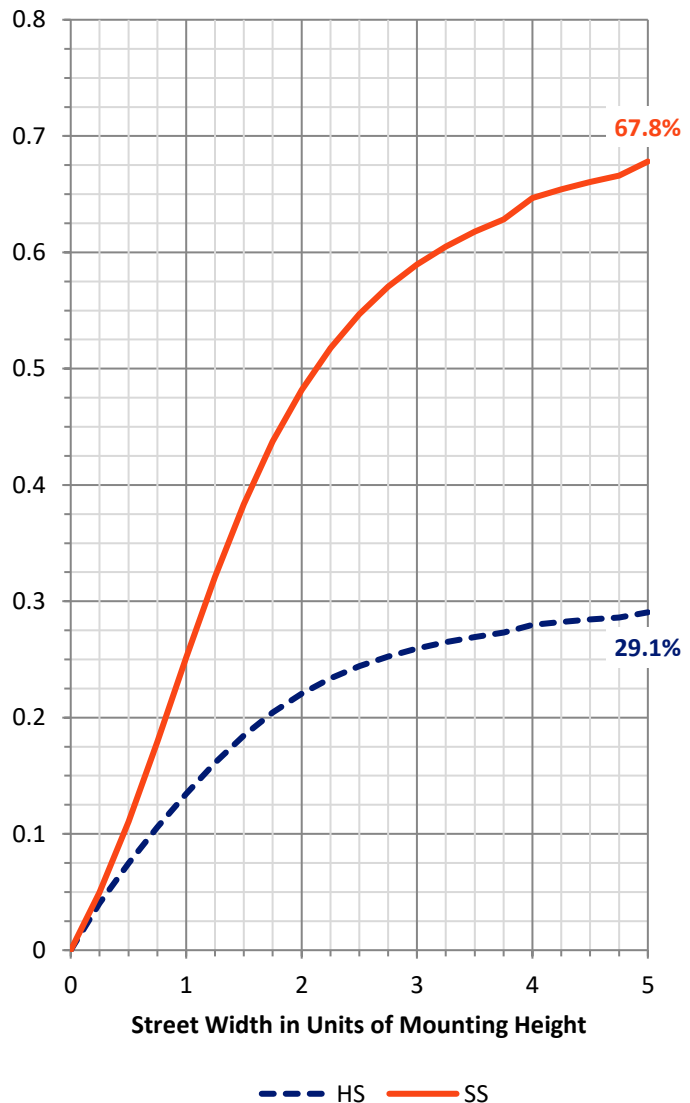
**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 1123.4   | 0.0    | 1123.4 |
|                    | % Fixture | 29.6     | 0.0    | 29.6   |
| <b>Street Side</b> | Lumens    | 2667.1   | 0.0    | 2667.1 |
|                    | % Fixture | 70.4     | 0.0    | 70.4   |
| <b>Total</b>       | Lumens    | 3790.5   | 0.0    | 3790.5 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**Coefficient of Utilization**

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 9.0    | 0.2       |
| 10°-20°   | 33.7   | 0.9       |
| 20°-30°   | 79.4   | 2.1       |
| 30°-40°   | 174.2  | 4.6       |
| 40°-50°   | 379.3  | 10.0      |
| 50°-60°   | 779.3  | 20.6      |
| 60°-70°   | 1097.9 | 29.0      |
| 70°-80°   | 932.1  | 24.6      |
| 80°-90°   | 305.5  | 8.1       |
| 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°    | 3790.5 | 100.0     |
| 0°-180°   | 3790.5 | 100.0     |



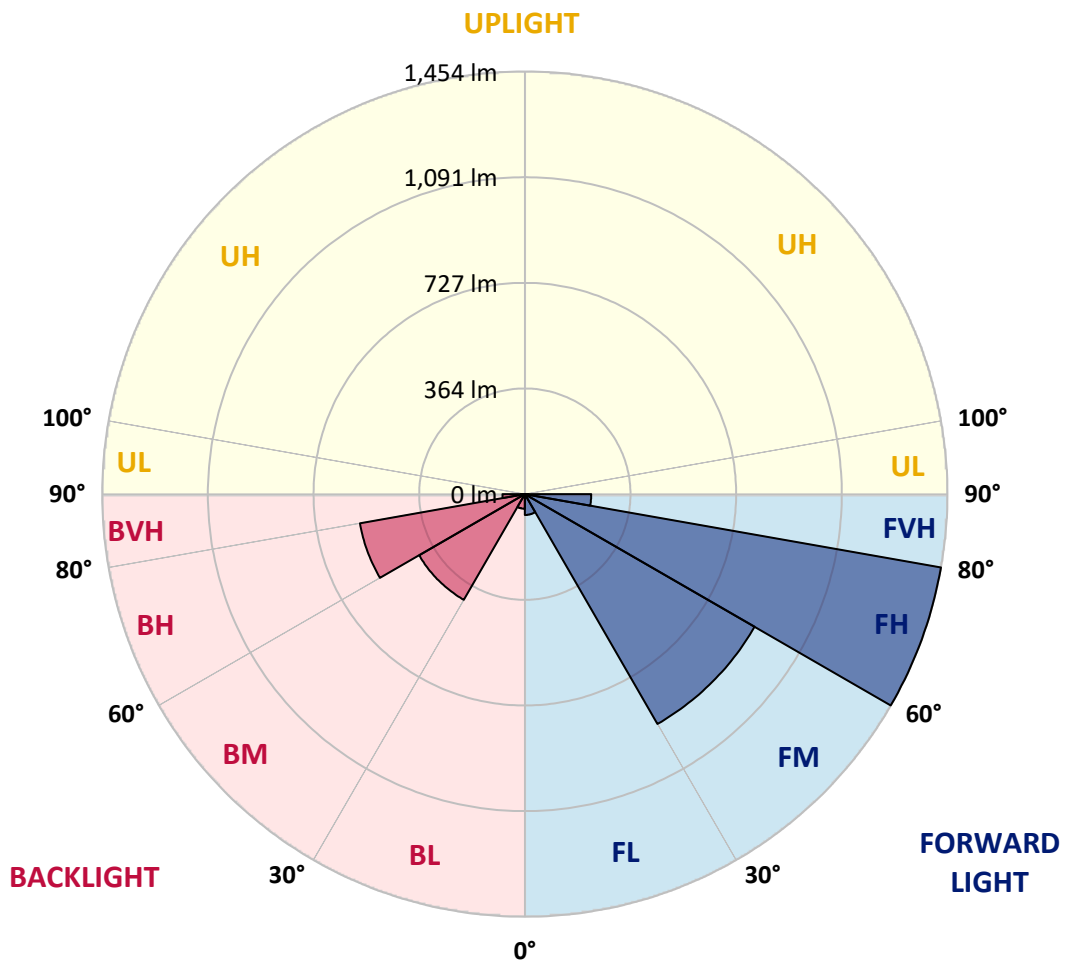
REPORT NUMBER: P880245  
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**LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:**

| Zone           | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|----------------|--------|-----------|-------------------------|------|---------|
|                |        |           | B                       | U    | G       |
| FL (0°-30°)    | 71.7   | 1.9       |                         |      |         |
| FM (30°-60°)   | 912.9  | 24.1      |                         |      |         |
| FH (60°-80°)   | 1454.0 | 38.4      |                         |      | G1/1800 |
| FVH (80°-90°)  | 228.4  | 6.0       |                         |      | G3/500  |
| BL (0°-30°)    | 50.4   | 1.3       | B0/110                  |      |         |
| BM (30°-60°)   | 419.9  | 11.1      | B1/1000                 |      |         |
| BH (60°-80°)   | 576.0  | 15.2      | B2/1000                 |      | G2/1000 |
| BVH (80°-90°)  | 77.0   | 2.0       |                         |      | G1/100  |
| UL (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B2-U0-G3**

Type IV Short





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 47°    | 55°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 87.5   | 87.5   | 87.5   | 87.5   | 87.5   | 87.5   | 87.5   | 87.5   | 87.5   | 87.5   | 87.5   |
| 2.5°  | 90.2   | 89.8   | 90.2   | 90.2   | 90.2   | 89.8   | 89.8   | 89.8   | 89.5   | 89.1   | 88.7   |
| 5°    | 95.7   | 95.7   | 95.7   | 95.3   | 95.3   | 94.5   | 94.5   | 94.1   | 93.3   | 92.6   | 91.8   |
| 7.5°  | 103.0  | 102.6  | 102.6  | 102.2  | 101.9  | 101.1  | 100.7  | 100.3  | 98.8   | 97.6   | 96.0   |
| 10°   | 111.9  | 111.9  | 111.5  | 110.8  | 110.8  | 108.8  | 109.2  | 108.4  | 106.5  | 104.2  | 101.5  |
| 12.5° | 122.8  | 122.8  | 122.0  | 122.0  | 121.2  | 119.7  | 119.3  | 118.1  | 116.2  | 112.3  | 109.2  |
| 15°   | 134.8  | 134.8  | 135.5  | 134.8  | 134.0  | 132.1  | 132.1  | 130.5  | 126.3  | 123.2  | 118.5  |
| 17.5° | 149.9  | 147.9  | 149.1  | 148.7  | 148.7  | 147.6  | 146.4  | 144.5  | 141.0  | 135.5  | 129.7  |
| 20°   | 165.4  | 165.8  | 164.6  | 165.8  | 166.1  | 164.6  | 164.6  | 162.3  | 157.2  | 150.7  | 141.4  |
| 22.5° | 184.7  | 184.7  | 182.4  | 185.5  | 187.4  | 186.3  | 185.9  | 181.2  | 175.1  | 166.1  | 156.8  |
| 25°   | 204.9  | 204.1  | 208.0  | 208.7  | 213.0  | 212.6  | 212.2  | 208.0  | 198.7  | 187.8  | 173.5  |
| 27.5° | 227.7  | 228.9  | 236.2  | 238.2  | 242.4  | 242.1  | 241.7  | 237.0  | 226.9  | 212.2  | 193.6  |
| 30°   | 256.0  | 257.5  | 264.5  | 271.1  | 278.5  | 279.2  | 278.5  | 274.6  | 259.9  | 240.5  | 219.6  |
| 32.5° | 288.9  | 293.2  | 300.1  | 311.4  | 320.7  | 324.9  | 325.7  | 318.7  | 302.1  | 276.5  | 249.0  |
| 35°   | 333.8  | 330.4  | 340.0  | 358.6  | 374.1  | 382.6  | 382.2  | 373.0  | 354.8  | 322.2  | 283.1  |
| 37.5° | 378.0  | 376.8  | 391.9  | 416.3  | 437.2  | 444.2  | 446.2  | 440.0  | 416.7  | 373.7  | 327.6  |
| 40°   | 424.1  | 433.8  | 451.2  | 479.5  | 510.4  | 525.2  | 526.3  | 517.4  | 485.7  | 437.2  | 376.4  |
| 42.5° | 484.1  | 493.8  | 515.9  | 550.7  | 595.6  | 620.0  | 621.6  | 611.5  | 573.2  | 510.4  | 435.3  |
| 45°   | 560.0  | 565.4  | 588.7  | 641.7  | 699.4  | 738.6  | 749.8  | 737.4  | 690.1  | 603.0  | 508.5  |
| 47.5° | 641.7  | 641.7  | 679.7  | 749.8  | 836.9  | 888.4  | 896.9  | 885.7  | 815.2  | 710.3  | 590.2  |
| 50°   | 732.7  | 733.1  | 793.5  | 893.9  | 1003.8 | 1068.1 | 1074.7 | 1047.6 | 962.4  | 819.5  | 673.5  |
| 52.5° | 827.2  | 837.3  | 925.6  | 1077.4 | 1225.0 | 1323.3 | 1329.9 | 1298.6 | 1185.1 | 976.0  | 762.2  |
| 55°   | 957.4  | 973.2  | 1101.4 | 1287.7 | 1441.1 | 1518.5 | 1518.9 | 1481.4 | 1345.0 | 1127.8 | 868.3  |
| 57.5° | 1137.8 | 1144.0 | 1263.7 | 1453.9 | 1598.7 | 1651.8 | 1647.9 | 1592.9 | 1435.7 | 1212.6 | 955.4  |
| 60°   | 1286.9 | 1301.3 | 1398.9 | 1575.5 | 1716.8 | 1753.2 | 1749.0 | 1676.2 | 1497.6 | 1262.2 | 997.3  |
| 62.5° | 1384.9 | 1391.9 | 1493.0 | 1662.6 | 1789.6 | 1820.2 | 1815.6 | 1747.8 | 1573.5 | 1348.5 | 1067.0 |
| 65°   | 1408.6 | 1420.2 | 1548.4 | 1720.7 | 1843.9 | 1912.8 | 1909.7 | 1873.3 | 1694.4 | 1412.4 | 1099.9 |
| 67.5° | 1379.9 | 1399.3 | 1556.5 | 1760.6 | 1908.9 | 1966.2 | 1964.7 | 1891.5 | 1668.4 | 1371.4 | 1058.4 |
| 70°   | 1321.4 | 1338.1 | 1533.3 | 1756.3 | 1889.9 | 1905.4 | 1893.4 | 1809.8 | 1592.1 | 1303.2 | 996.5  |
| 72.5° | 1229.2 | 1257.5 | 1448.1 | 1659.1 | 1770.7 | 1780.7 | 1776.5 | 1674.2 | 1477.5 | 1185.9 | 902.8  |
| 75°   | 1108.4 | 1142.9 | 1315.6 | 1486.4 | 1592.5 | 1609.9 | 1601.8 | 1512.3 | 1313.3 | 1039.1 | 786.6  |
| 77.5° | 955.4  | 974.8  | 1106.5 | 1268.7 | 1390.7 | 1393.8 | 1389.2 | 1289.3 | 1106.1 | 870.2  | 661.9  |
| 80°   | 752.9  | 764.5  | 878.7  | 1013.9 | 1115.0 | 1127.4 | 1123.1 | 1055.7 | 878.4  | 688.6  | 516.2  |
| 82.5° | 557.7  | 549.9  | 626.6  | 737.4  | 837.7  | 838.5  | 845.4  | 770.7  | 657.6  | 499.6  | 369.5  |
| 85°   | 321.1  | 324.2  | 390.8  | 466.3  | 527.1  | 562.3  | 561.9  | 525.9  | 422.9  | 318.0  | 225.4  |
| 87.5° | 89.5   | 96.4   | 138.6  | 201.8  | 229.3  | 249.4  | 242.1  | 218.4  | 176.6  | 99.9   | 57.3   |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



REPORT NUMBER: P880245

CATALOG NUMBER: EMM2-HTN-VA2-830-U-WT4

**CANDELA DISTRIBUTION (continued):**

|       | 90°   | 95°   | 105°  | 115°  | 125°  | 135°  | 145°  | 155°  | 165°  | 175°  | 180°  |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0°    | 87.5  | 87.5  | 87.5  | 87.5  | 87.5  | 87.5  | 87.5  | 87.5  | 87.5  | 87.5  | 87.5  |
| 2.5°  | 88.7  | 88.3  | 87.9  | 87.5  | 86.8  | 86.8  | 86.4  | 86.8  | 86.8  | 86.8  | 86.8  |
| 5°    | 91.0  | 90.6  | 89.5  | 88.7  | 87.5  | 86.8  | 86.4  | 86.4  | 86.4  | 86.4  | 86.4  |
| 7.5°  | 94.9  | 94.5  | 92.6  | 91.0  | 89.5  | 88.7  | 87.9  | 87.5  | 87.1  | 86.8  | 87.1  |
| 10°   | 100.7 | 99.1  | 97.2  | 94.9  | 92.6  | 91.4  | 90.2  | 89.8  | 89.5  | 89.1  | 89.1  |
| 12.5° | 107.3 | 106.1 | 102.6 | 99.5  | 97.2  | 95.3  | 93.7  | 92.9  | 92.6  | 92.2  | 92.2  |
| 15°   | 116.2 | 113.9 | 109.2 | 105.3 | 101.9 | 99.5  | 98.0  | 97.2  | 96.8  | 96.4  | 96.4  |
| 17.5° | 126.3 | 123.2 | 117.0 | 111.9 | 108.1 | 105.0 | 103.0 | 101.9 | 101.1 | 101.5 | 101.9 |
| 20°   | 137.9 | 132.8 | 125.9 | 119.7 | 114.6 | 111.2 | 109.2 | 107.7 | 106.9 | 107.3 | 107.7 |
| 22.5° | 151.4 | 146.0 | 135.9 | 128.6 | 122.4 | 118.1 | 116.2 | 115.0 | 114.2 | 113.9 | 113.1 |
| 25°   | 166.9 | 159.9 | 148.3 | 138.3 | 130.9 | 126.6 | 124.3 | 123.5 | 122.8 | 122.0 | 122.0 |
| 27.5° | 185.5 | 177.4 | 161.5 | 150.7 | 141.7 | 137.5 | 134.8 | 133.6 | 133.6 | 132.5 | 132.5 |
| 30°   | 207.2 | 196.4 | 177.0 | 162.7 | 153.8 | 148.3 | 145.2 | 144.8 | 144.1 | 145.2 | 145.2 |
| 32.5° | 233.1 | 218.4 | 194.8 | 178.2 | 168.1 | 163.0 | 159.9 | 159.2 | 158.0 | 158.8 | 161.1 |
| 35°   | 265.7 | 246.7 | 218.4 | 198.7 | 186.3 | 181.2 | 177.4 | 177.0 | 175.1 | 177.0 | 173.9 |
| 37.5° | 302.1 | 281.2 | 243.6 | 220.4 | 206.8 | 201.0 | 198.3 | 197.1 | 196.7 | 196.7 | 194.4 |
| 40°   | 346.6 | 321.4 | 275.7 | 247.1 | 231.6 | 224.6 | 221.9 | 221.5 | 220.8 | 223.5 | 220.8 |
| 42.5° | 401.6 | 363.3 | 309.1 | 276.5 | 260.6 | 253.3 | 250.2 | 249.0 | 251.0 | 252.1 | 251.7 |
| 45°   | 462.8 | 421.4 | 351.7 | 314.1 | 295.9 | 288.5 | 284.3 | 283.1 | 283.9 | 283.9 | 287.8 |
| 47.5° | 533.3 | 484.5 | 400.5 | 355.1 | 338.5 | 329.6 | 326.9 | 323.0 | 321.1 | 320.3 | 326.9 |
| 50°   | 606.9 | 546.1 | 450.4 | 399.7 | 384.6 | 377.6 | 378.4 | 370.6 | 367.9 | 364.8 | 364.0 |
| 52.5° | 680.8 | 611.9 | 507.3 | 461.6 | 444.2 | 447.7 | 446.2 | 438.0 | 422.1 | 418.3 | 409.0 |
| 55°   | 769.5 | 686.3 | 561.9 | 507.3 | 492.2 | 494.9 | 501.1 | 501.1 | 497.7 | 489.1 | 481.8 |
| 57.5° | 844.7 | 747.8 | 603.0 | 534.8 | 521.7 | 528.6 | 541.0 | 550.3 | 558.5 | 564.7 | 564.3 |
| 60°   | 886.5 | 785.8 | 629.7 | 555.8 | 540.3 | 553.8 | 572.4 | 588.3 | 605.7 | 623.9 | 623.1 |
| 62.5° | 944.2 | 838.9 | 677.4 | 592.9 | 566.2 | 570.5 | 591.8 | 619.3 | 635.1 | 650.2 | 654.5 |
| 65°   | 959.3 | 848.5 | 695.2 | 619.3 | 597.6 | 598.4 | 612.7 | 635.1 | 648.7 | 652.6 | 654.9 |
| 67.5° | 918.6 | 805.9 | 665.7 | 603.8 | 592.2 | 603.0 | 626.2 | 644.1 | 646.0 | 636.7 | 635.9 |
| 70°   | 857.4 | 753.7 | 619.3 | 567.4 | 560.0 | 576.7 | 607.3 | 628.6 | 623.9 | 604.9 | 603.8 |
| 72.5° | 771.1 | 674.6 | 556.9 | 519.3 | 512.0 | 532.9 | 560.0 | 582.5 | 575.5 | 561.2 | 560.0 |
| 75°   | 667.3 | 577.1 | 481.4 | 453.5 | 453.1 | 476.0 | 499.6 | 513.2 | 512.8 | 502.7 | 499.6 |
| 77.5° | 554.6 | 481.4 | 396.6 | 371.4 | 380.7 | 402.4 | 419.8 | 429.9 | 426.4 | 422.9 | 421.8 |
| 80°   | 434.1 | 369.1 | 306.0 | 290.9 | 305.2 | 312.5 | 331.1 | 330.4 | 332.3 | 324.9 | 330.4 |
| 82.5° | 309.1 | 266.1 | 219.2 | 212.6 | 214.6 | 229.3 | 239.3 | 238.2 | 233.1 | 227.7 | 225.4 |
| 85°   | 187.4 | 163.8 | 140.6 | 131.3 | 137.9 | 136.7 | 142.9 | 137.9 | 134.8 | 132.1 | 134.4 |
| 87.5° | 51.9  | 44.9  | 43.0  | 31.0  | 38.3  | 30.2  | 31.8  | 22.1  | 19.4  | 23.2  | 20.1  |
| 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: SP1-2407-176-7

Test Date: 09/27/2024

Luminaire Tested: MEM2-HTN-VA-30-830-U-WQ

Data in this report applies to families of products including MEM2-HTN-VA-30-830-U-WQ

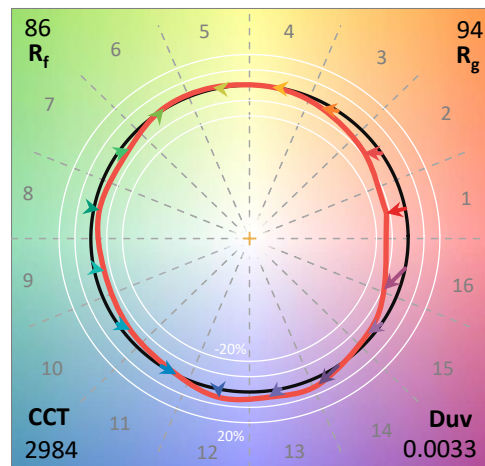
**Test Information**

Test Method: LM-79-2019  
 Report Number: SP1-2407-176-7  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry: 4π  
 Issue Date: 09/27/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: Streetworks  
 Catalog Number: **MEM2-HTN-VA-30-830-U-WQ**  
 Description: EPIC MODERN VISUAL COMFORT 30W WAVESTREAM WIDE

**Spectral Parameters**

CCT (K): 2984  
 CIE u': 0.2500  
 CIE v': 0.5264  
 Duv: 0.0033  
 CIE x: 0.4431  
 CIE y: 0.4147  
 CIE z: 0.1422  
 Peak Wavelength (nm): 601  
 Dominant Wavelength (nm): 581  
 Purity: 57.4798  
 Rf: 85.8  
 Rg: 94.1

|           |      |      |      |
|-----------|------|------|------|
| CRI (Ra): | 81.8 |      |      |
| R1:       | 79.4 | R9:  | -1.1 |
| R2:       | 89.9 | R10: | 78.4 |
| R3:       | 96.6 | R11: | 80.8 |
| R4:       | 80.6 | R12: | 72.8 |
| R5:       | 80.1 | R13: | 81.7 |
| R6:       | 88.9 | R14: | 98.5 |
| R7:       | 82.6 | R15: | 70.2 |
| R8:       | 56.0 |      |      |



**Test Conditions**

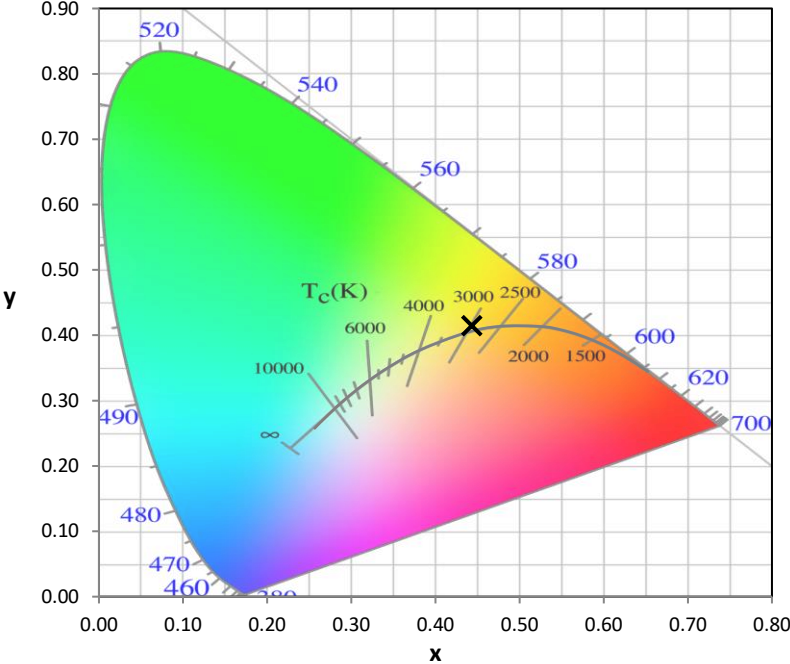
Stabilization Time: 29M  
 Operation Time: 1H 29M  
 Sphere Temperature (°C): 25.2

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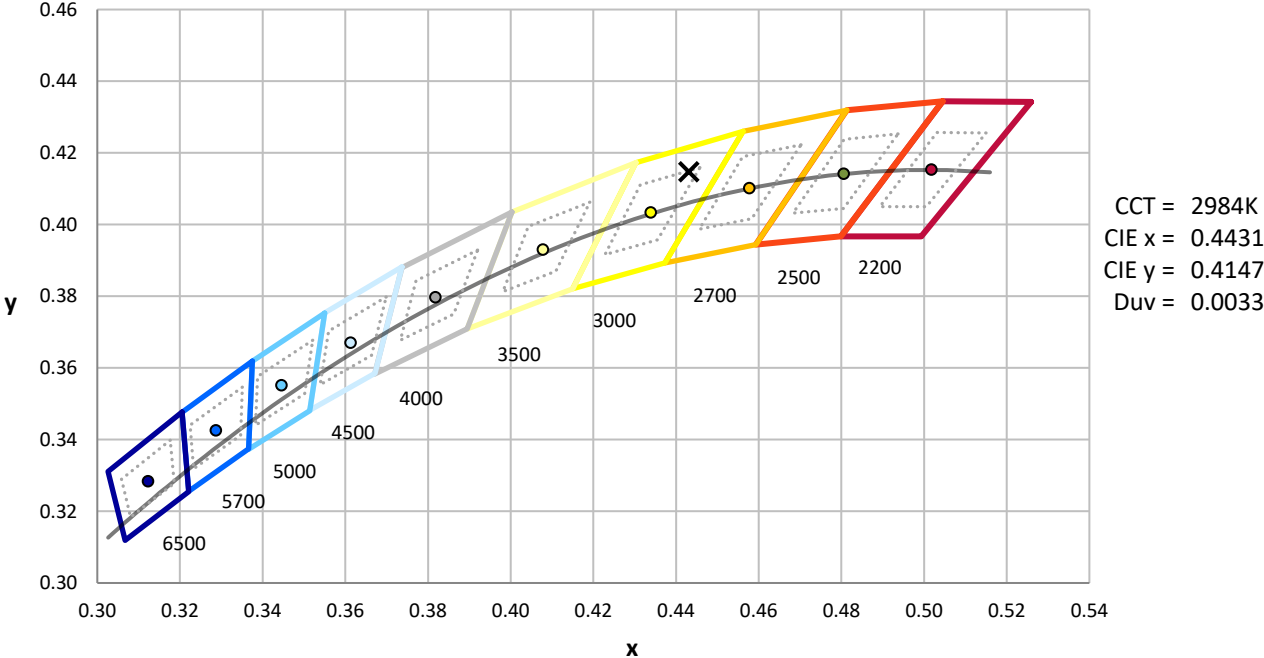
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| 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



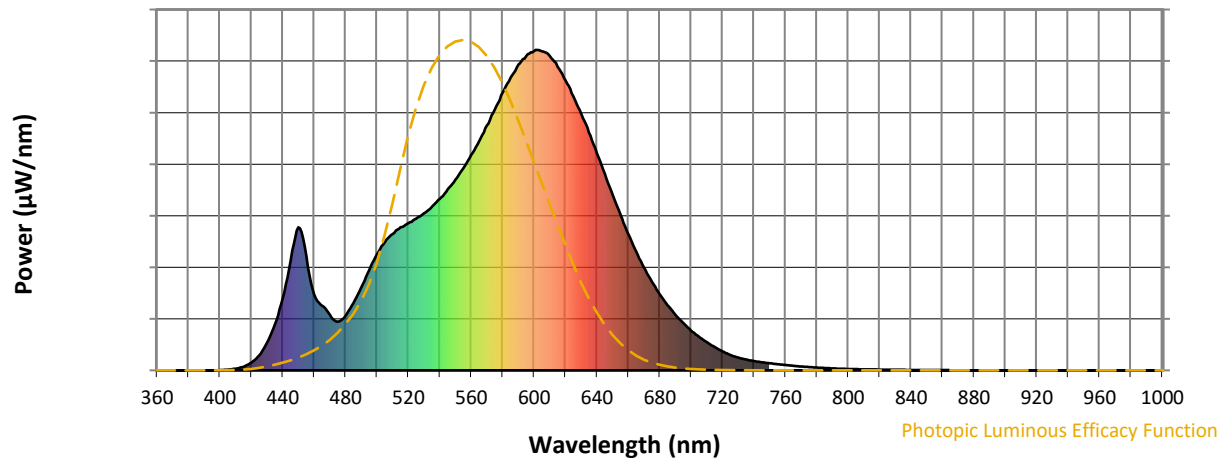
CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles



Point lies inside the ANSI 3000K 4-step quadrangle

REPORT NUMBER: SP1-2407-176-7

**Photopic Flux vs. Wavelength**

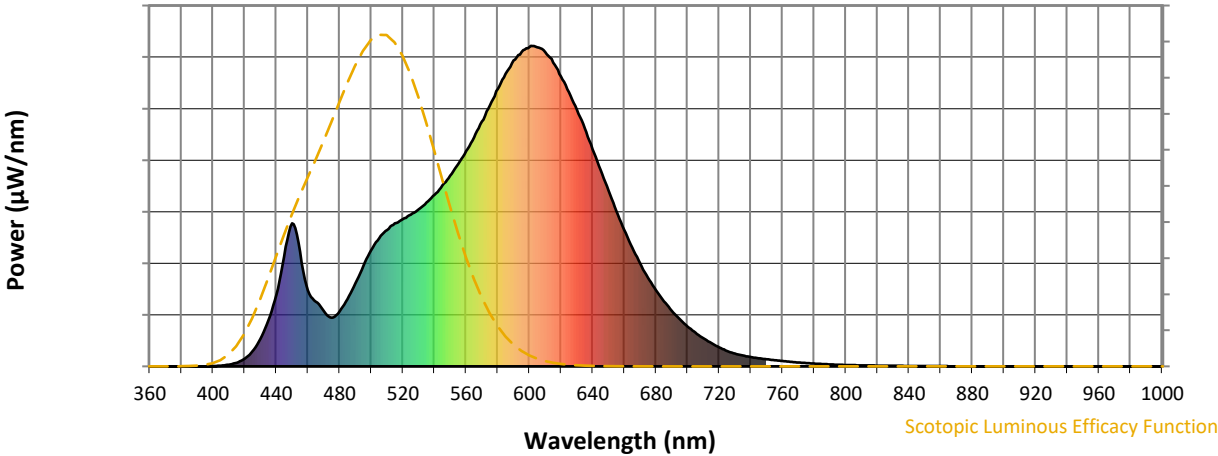


**Photopic Lumens: NR**

| 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    | 260                      | NR            | 620    | 905                      | NR            | 750    | 22                       | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 312                      | NR            | 625    | 856                      | NR            | 755    | 19                       | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 362                      | NR            | 630    | 801                      | NR            | 760    | 17                       | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 399                      | NR            | 635    | 742                      | NR            | 765    | 14                       | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 425                      | NR            | 640    | 677                      | NR            | 770    | 12                       | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 446                      | NR            | 645    | 613                      | NR            | 775    | 10                       | NR            | 905    | 0                        | NR            |
| 390    | 0                        | NR            | 520    | 459                      | NR            | 650    | 549                      | NR            | 780    | 9                        | NR            | 910    | 0                        | NR            |
| 395    | 0                        | NR            | 525    | 473                      | NR            | 655    | 485                      | NR            | 785    | 7                        | NR            | 915    | 0                        | NR            |
| 400    | 1                        | NR            | 530    | 490                      | NR            | 660    | 425                      | NR            | 790    | 6                        | NR            | 920    | 0                        | NR            |
| 405    | 2                        | NR            | 535    | 511                      | NR            | 665    | 371                      | NR            | 795    | 5                        | NR            | 925    | 0                        | NR            |
| 410    | 5                        | NR            | 540    | 535                      | NR            | 670    | 321                      | NR            | 800    | 4                        | NR            | 930    | 0                        | NR            |
| 415    | 11                       | NR            | 545    | 565                      | NR            | 675    | 276                      | NR            | 805    | 4                        | NR            | 935    | 0                        | NR            |
| 420    | 24                       | NR            | 550    | 595                      | NR            | 680    | 238                      | NR            | 810    | 3                        | NR            | 940    | 0                        | NR            |
| 425    | 47                       | NR            | 555    | 631                      | NR            | 685    | 203                      | NR            | 815    | 3                        | NR            | 945    | 0                        | NR            |
| 430    | 86                       | NR            | 560    | 672                      | NR            | 690    | 174                      | NR            | 820    | 2                        | NR            | 950    | 0                        | NR            |
| 435    | 144                      | NR            | 565    | 715                      | NR            | 695    | 148                      | NR            | 825    | 2                        | NR            | 955    | 0                        | NR            |
| 440    | 224                      | NR            | 570    | 763                      | NR            | 700    | 124                      | NR            | 830    | 2                        | NR            | 960    | 0                        | NR            |
| 445    | 342                      | NR            | 575    | 814                      | NR            | 705    | 105                      | NR            | 835    | 2                        | NR            | 965    | 0                        | NR            |
| 450    | 446                      | NR            | 580    | 866                      | NR            | 710    | 88                       | NR            | 840    | 1                        | NR            | 970    | 0                        | NR            |
| 455    | 357                      | NR            | 585    | 912                      | NR            | 715    | 73                       | NR            | 845    | 1                        | NR            | 975    | 0                        | NR            |
| 460    | 237                      | NR            | 590    | 954                      | NR            | 720    | 59                       | NR            | 850    | 1                        | NR            | 980    | 0                        | NR            |
| 465    | 202                      | NR            | 595    | 981                      | NR            | 725    | 48                       | NR            | 855    | 1                        | NR            | 985    | 0                        | NR            |
| 470    | 172                      | NR            | 600    | 996                      | NR            | 730    | 40                       | NR            | 860    | 1                        | NR            | 990    | 0                        | NR            |
| 475    | 152                      | NR            | 605    | 996                      | NR            | 735    | 34                       | NR            | 865    | 1                        | NR            | 995    | 0                        | NR            |
| 480    | 171                      | NR            | 610    | 980                      | NR            | 740    | 29                       | NR            | 870    | 0                        | NR            | 1000   | 0                        | NR            |
| 485    | 210                      | NR            | 615    | 947                      | NR            | 745    | 25                       | NR            | 875    | 0                        | NR            |        |                          |               |

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Scotopic Flux vs. Wavelength

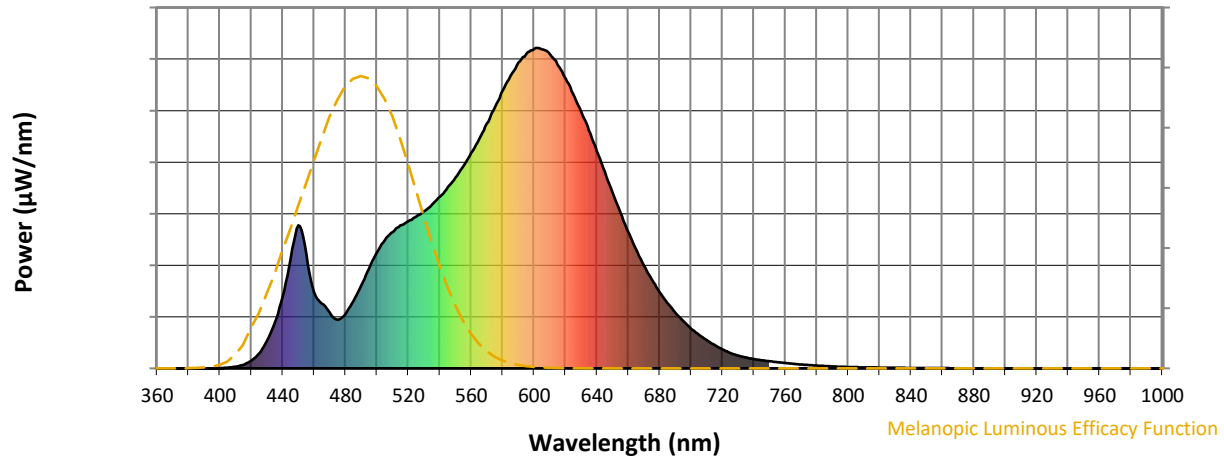


Scotopic Lumens: NR S/P: 1.32

| 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    | 260                      | NR            | 620    | 905                      | NR            | 750    | 22                       | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 312                      | NR            | 625    | 856                      | NR            | 755    | 19                       | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 362                      | NR            | 630    | 801                      | NR            | 760    | 17                       | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 399                      | NR            | 635    | 742                      | NR            | 765    | 14                       | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 425                      | NR            | 640    | 677                      | NR            | 770    | 12                       | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 446                      | NR            | 645    | 613                      | NR            | 775    | 10                       | NR            | 905    | 0                        | NR            |
| 390    | 0                        | NR            | 520    | 459                      | NR            | 650    | 549                      | NR            | 780    | 9                        | NR            | 910    | 0                        | NR            |
| 395    | 0                        | NR            | 525    | 473                      | NR            | 655    | 485                      | NR            | 785    | 7                        | NR            | 915    | 0                        | NR            |
| 400    | 1                        | NR            | 530    | 490                      | NR            | 660    | 425                      | NR            | 790    | 6                        | NR            | 920    | 0                        | NR            |
| 405    | 2                        | NR            | 535    | 511                      | NR            | 665    | 371                      | NR            | 795    | 5                        | NR            | 925    | 0                        | NR            |
| 410    | 5                        | NR            | 540    | 535                      | NR            | 670    | 321                      | NR            | 800    | 4                        | NR            | 930    | 0                        | NR            |
| 415    | 11                       | NR            | 545    | 565                      | NR            | 675    | 276                      | NR            | 805    | 4                        | NR            | 935    | 0                        | NR            |
| 420    | 24                       | NR            | 550    | 595                      | NR            | 680    | 238                      | NR            | 810    | 3                        | NR            | 940    | 0                        | NR            |
| 425    | 47                       | NR            | 555    | 631                      | NR            | 685    | 203                      | NR            | 815    | 3                        | NR            | 945    | 0                        | NR            |
| 430    | 86                       | NR            | 560    | 672                      | NR            | 690    | 174                      | NR            | 820    | 2                        | NR            | 950    | 0                        | NR            |
| 435    | 144                      | NR            | 565    | 715                      | NR            | 695    | 148                      | NR            | 825    | 2                        | NR            | 955    | 0                        | NR            |
| 440    | 224                      | NR            | 570    | 763                      | NR            | 700    | 124                      | NR            | 830    | 2                        | NR            | 960    | 0                        | NR            |
| 445    | 342                      | NR            | 575    | 814                      | NR            | 705    | 105                      | NR            | 835    | 2                        | NR            | 965    | 0                        | NR            |
| 450    | 446                      | NR            | 580    | 866                      | NR            | 710    | 88                       | NR            | 840    | 1                        | NR            | 970    | 0                        | NR            |
| 455    | 357                      | NR            | 585    | 912                      | NR            | 715    | 73                       | NR            | 845    | 1                        | NR            | 975    | 0                        | NR            |
| 460    | 237                      | NR            | 590    | 954                      | NR            | 720    | 59                       | NR            | 850    | 1                        | NR            | 980    | 0                        | NR            |
| 465    | 202                      | NR            | 595    | 981                      | NR            | 725    | 48                       | NR            | 855    | 1                        | NR            | 985    | 0                        | NR            |
| 470    | 172                      | NR            | 600    | 996                      | NR            | 730    | 40                       | NR            | 860    | 1                        | NR            | 990    | 0                        | NR            |
| 475    | 152                      | NR            | 605    | 996                      | NR            | 735    | 34                       | NR            | 865    | 1                        | NR            | 995    | 0                        | NR            |
| 480    | 171                      | NR            | 610    | 980                      | NR            | 740    | 29                       | NR            | 870    | 0                        | NR            | 1000   | 0                        | NR            |
| 485    | 210                      | NR            | 615    | 947                      | NR            | 745    | 25                       | NR            | 875    | 0                        | NR            |        |                          |               |

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Melanopic Flux vs. Wavelength



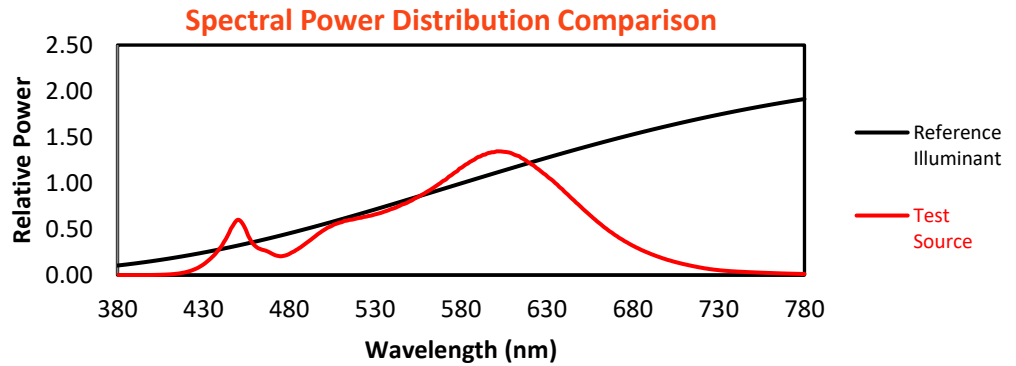
Melanopic Lumens: NR

M/P: 2.51

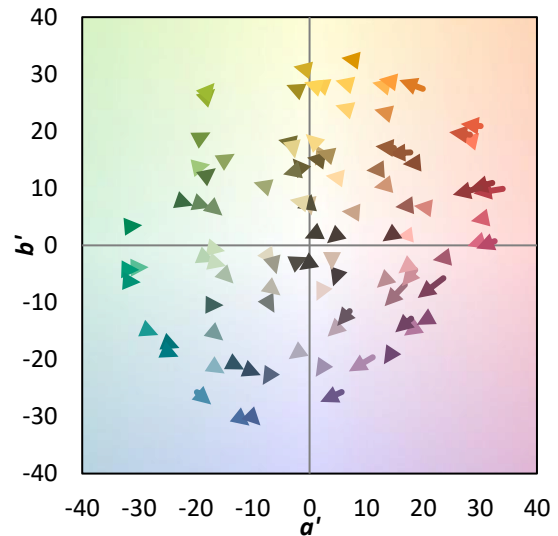
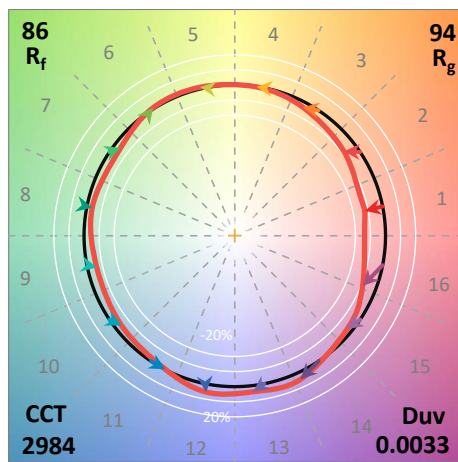
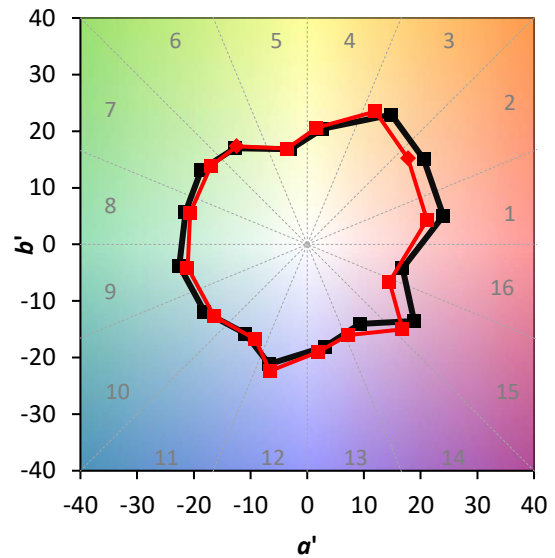
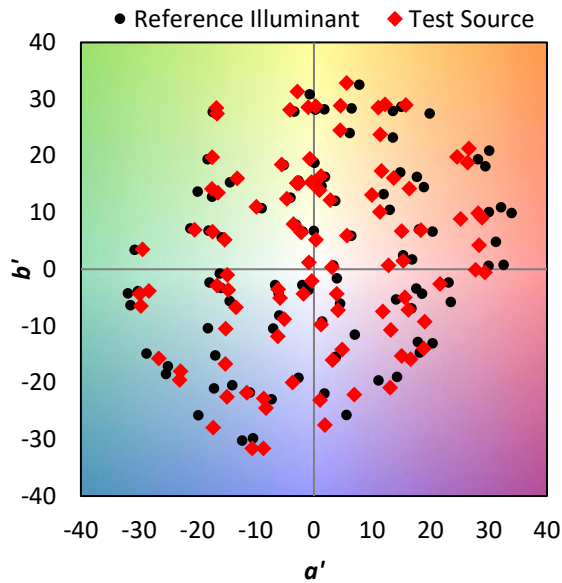
| λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) | λ (nm) | Power W <sup>^</sup> /nm | Lumens (φ/nm) |
|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|--------|--------------------------|---------------|
| 360    | 0                        | NR            | 490    | 260                      | NR            | 620    | 905                      | NR            | 750    | 22                       | NR            | 880    | 0                        | NR            |
| 365    | 0                        | NR            | 495    | 312                      | NR            | 625    | 856                      | NR            | 755    | 19                       | NR            | 885    | 0                        | NR            |
| 370    | 0                        | NR            | 500    | 362                      | NR            | 630    | 801                      | NR            | 760    | 17                       | NR            | 890    | 0                        | NR            |
| 375    | 0                        | NR            | 505    | 399                      | NR            | 635    | 742                      | NR            | 765    | 14                       | NR            | 895    | 0                        | NR            |
| 380    | 0                        | NR            | 510    | 425                      | NR            | 640    | 677                      | NR            | 770    | 12                       | NR            | 900    | 0                        | NR            |
| 385    | 0                        | NR            | 515    | 446                      | NR            | 645    | 613                      | NR            | 775    | 10                       | NR            | 905    | 0                        | NR            |
| 390    | 0                        | NR            | 520    | 459                      | NR            | 650    | 549                      | NR            | 780    | 9                        | NR            | 910    | 0                        | NR            |
| 395    | 0                        | NR            | 525    | 473                      | NR            | 655    | 485                      | NR            | 785    | 7                        | NR            | 915    | 0                        | NR            |
| 400    | 1                        | NR            | 530    | 490                      | NR            | 660    | 425                      | NR            | 790    | 6                        | NR            | 920    | 0                        | NR            |
| 405    | 2                        | NR            | 535    | 511                      | NR            | 665    | 371                      | NR            | 795    | 5                        | NR            | 925    | 0                        | NR            |
| 410    | 5                        | NR            | 540    | 535                      | NR            | 670    | 321                      | NR            | 800    | 4                        | NR            | 930    | 0                        | NR            |
| 415    | 11                       | NR            | 545    | 565                      | NR            | 675    | 276                      | NR            | 805    | 4                        | NR            | 935    | 0                        | NR            |
| 420    | 24                       | NR            | 550    | 595                      | NR            | 680    | 238                      | NR            | 810    | 3                        | NR            | 940    | 0                        | NR            |
| 425    | 47                       | NR            | 555    | 631                      | NR            | 685    | 203                      | NR            | 815    | 3                        | NR            | 945    | 0                        | NR            |
| 430    | 86                       | NR            | 560    | 672                      | NR            | 690    | 174                      | NR            | 820    | 2                        | NR            | 950    | 0                        | NR            |
| 435    | 144                      | NR            | 565    | 715                      | NR            | 695    | 148                      | NR            | 825    | 2                        | NR            | 955    | 0                        | NR            |
| 440    | 224                      | NR            | 570    | 763                      | NR            | 700    | 124                      | NR            | 830    | 2                        | NR            | 960    | 0                        | NR            |
| 445    | 342                      | NR            | 575    | 814                      | NR            | 705    | 105                      | NR            | 835    | 2                        | NR            | 965    | 0                        | NR            |
| 450    | 446                      | NR            | 580    | 866                      | NR            | 710    | 88                       | NR            | 840    | 1                        | NR            | 970    | 0                        | NR            |
| 455    | 357                      | NR            | 585    | 912                      | NR            | 715    | 73                       | NR            | 845    | 1                        | NR            | 975    | 0                        | NR            |
| 460    | 237                      | NR            | 590    | 954                      | NR            | 720    | 59                       | NR            | 850    | 1                        | NR            | 980    | 0                        | NR            |
| 465    | 202                      | NR            | 595    | 981                      | NR            | 725    | 48                       | NR            | 855    | 1                        | NR            | 985    | 0                        | NR            |
| 470    | 172                      | NR            | 600    | 996                      | NR            | 730    | 40                       | NR            | 860    | 1                        | NR            | 990    | 0                        | NR            |
| 475    | 152                      | NR            | 605    | 996                      | NR            | 735    | 34                       | NR            | 865    | 1                        | NR            | 995    | 0                        | NR            |
| 480    | 171                      | NR            | 610    | 980                      | NR            | 740    | 29                       | NR            | 870    | 0                        | NR            | 1000   | 0                        | NR            |
| 485    | 210                      | NR            | 615    | 947                      | NR            | 745    | 25                       | NR            | 875    | 0                        | NR            |        |                          |               |

**Summary**

$R_f = 85.8$   
 $R_g = 94.1$   
 $CIE R_a = 81.8$   
 $R_9 = -1.1$



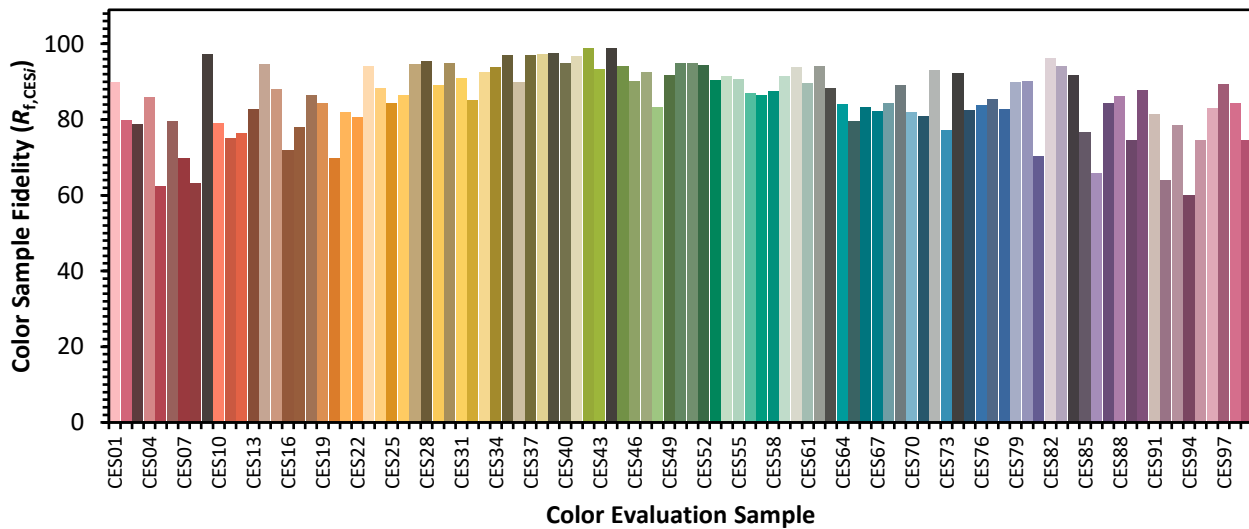
**Color Vector Graphics**



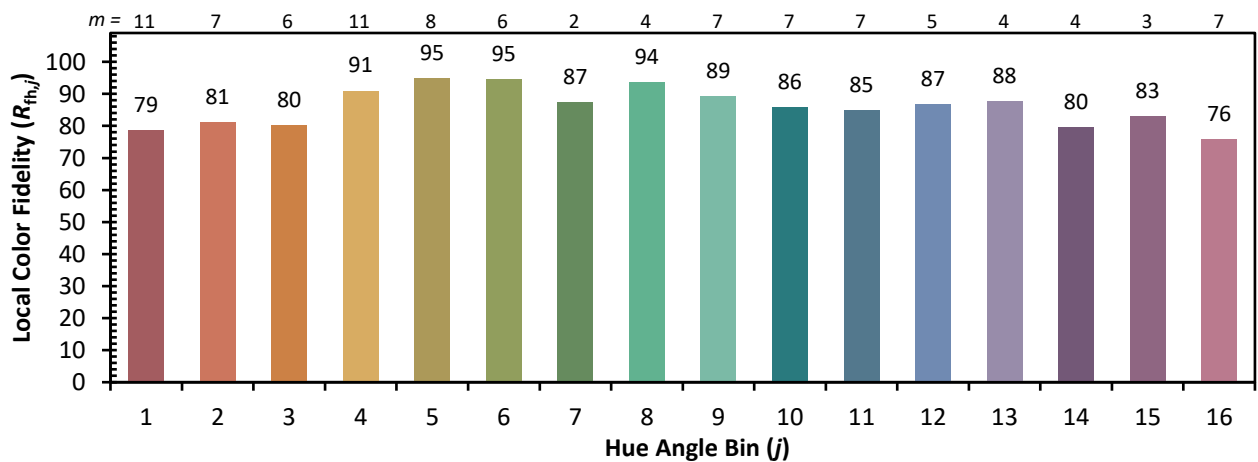
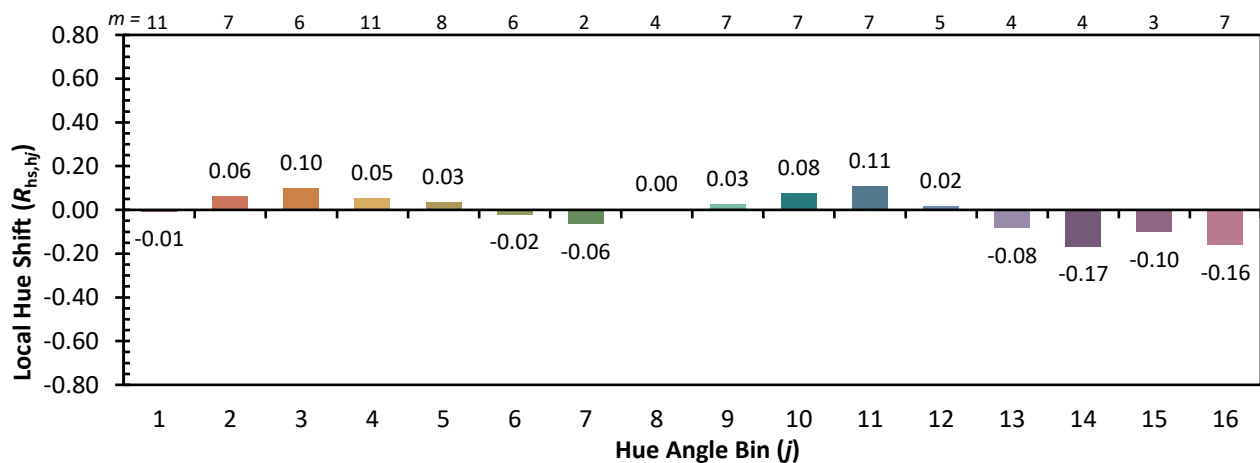
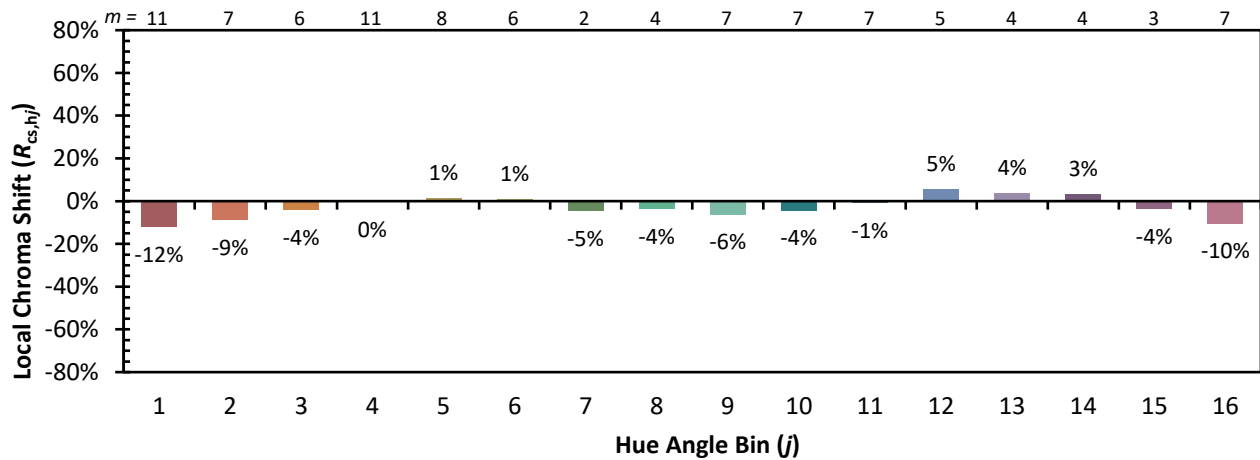


Individual Sample Fidelity Index ( $R_{f,i}$ )

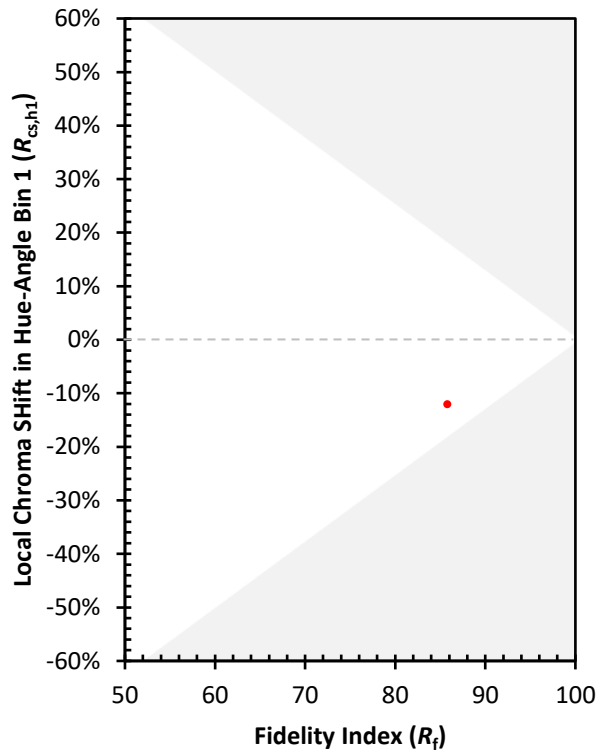
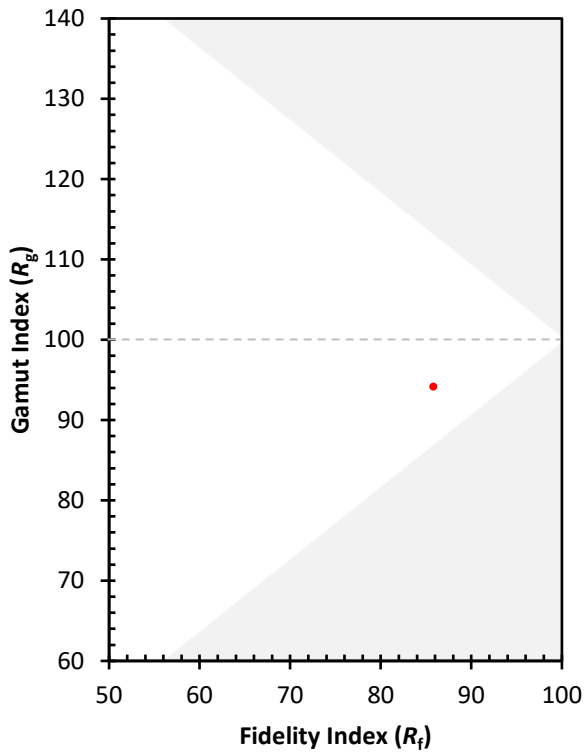
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 86 | CES51 = 95 | CES76 = 84 |
| CES02 = 63 | CES27 = 95 | CES52 = 94 | CES77 = 86 |
| CES03 = 31 | CES28 = 95 | CES53 = 90 | CES78 = 83 |
| CES04 = 70 | CES29 = 89 | CES54 = 91 | CES79 = 90 |
| CES05 = 50 | CES30 = 95 | CES55 = 91 | CES80 = 90 |
| CES06 = 51 | CES31 = 91 | CES56 = 87 | CES81 = 70 |
| CES07 = 42 | CES32 = 85 | CES57 = 86 | CES82 = 96 |
| CES08 = 41 | CES33 = 93 | CES58 = 87 | CES83 = 94 |
| CES09 = 29 | CES34 = 94 | CES59 = 92 | CES84 = 92 |
| CES10 = 76 | CES35 = 97 | CES60 = 94 | CES85 = 77 |
| CES11 = 59 | CES36 = 90 | CES61 = 90 | CES86 = 66 |
| CES12 = 65 | CES37 = 97 | CES62 = 94 | CES87 = 84 |
| CES13 = 43 | CES38 = 97 | CES63 = 88 | CES88 = 86 |
| CES14 = 74 | CES39 = 98 | CES64 = 84 | CES89 = 75 |
| CES15 = 72 | CES40 = 95 | CES65 = 80 | CES90 = 88 |
| CES16 = 47 | CES41 = 97 | CES66 = 83 | CES91 = 81 |
| CES17 = 50 | CES42 = 99 | CES67 = 82 | CES92 = 64 |
| CES18 = 56 | CES43 = 93 | CES68 = 84 | CES93 = 79 |
| CES19 = 72 | CES44 = 99 | CES69 = 89 | CES94 = 60 |
| CES20 = 67 | CES45 = 94 | CES70 = 82 | CES95 = 74 |
| CES21 = 87 | CES46 = 90 | CES71 = 81 | CES96 = 83 |
| CES22 = 79 | CES47 = 93 | CES72 = 93 | CES97 = 89 |
| CES23 = 92 | CES48 = 83 | CES73 = 77 | CES98 = 84 |
| CES24 = 91 | CES49 = 92 | CES74 = 92 | CES99 = 75 |
| CES25 = 72 | CES50 = 95 | CES75 = 83 |            |



Color Rendition by Hue-Angle Bin



Measure Comparisons



(END OF REPORT)