

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: P472202

Luminaire Tested: **CCP-VA-2-850-U-T4W**

Issue Date: 01/27/2021



**Test Information**

Test Method: LM-79-08  
Report Number: P472202  
Test Lab: INNOVATION CENTER(G3)  
Issue Date: 01/27/2021  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: INVUE  
Catalog Number: CCP-VA-2-850-U-T4W  
Description: INVUE CLEARCURVE POLE MOUNT Wave Stream LUMINAIRE WITH T4W  
DISTRIBUTION LENS  
Light Source: 5000K CCT, 80 CRI LEDS  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 4258.8 lumens  
Efficiency: N/A  
Efficacy: 108.6 lumens/watt  
Luminous Opening: Rectangular (W 1' x L: 0.54' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B2 - U0 - G2

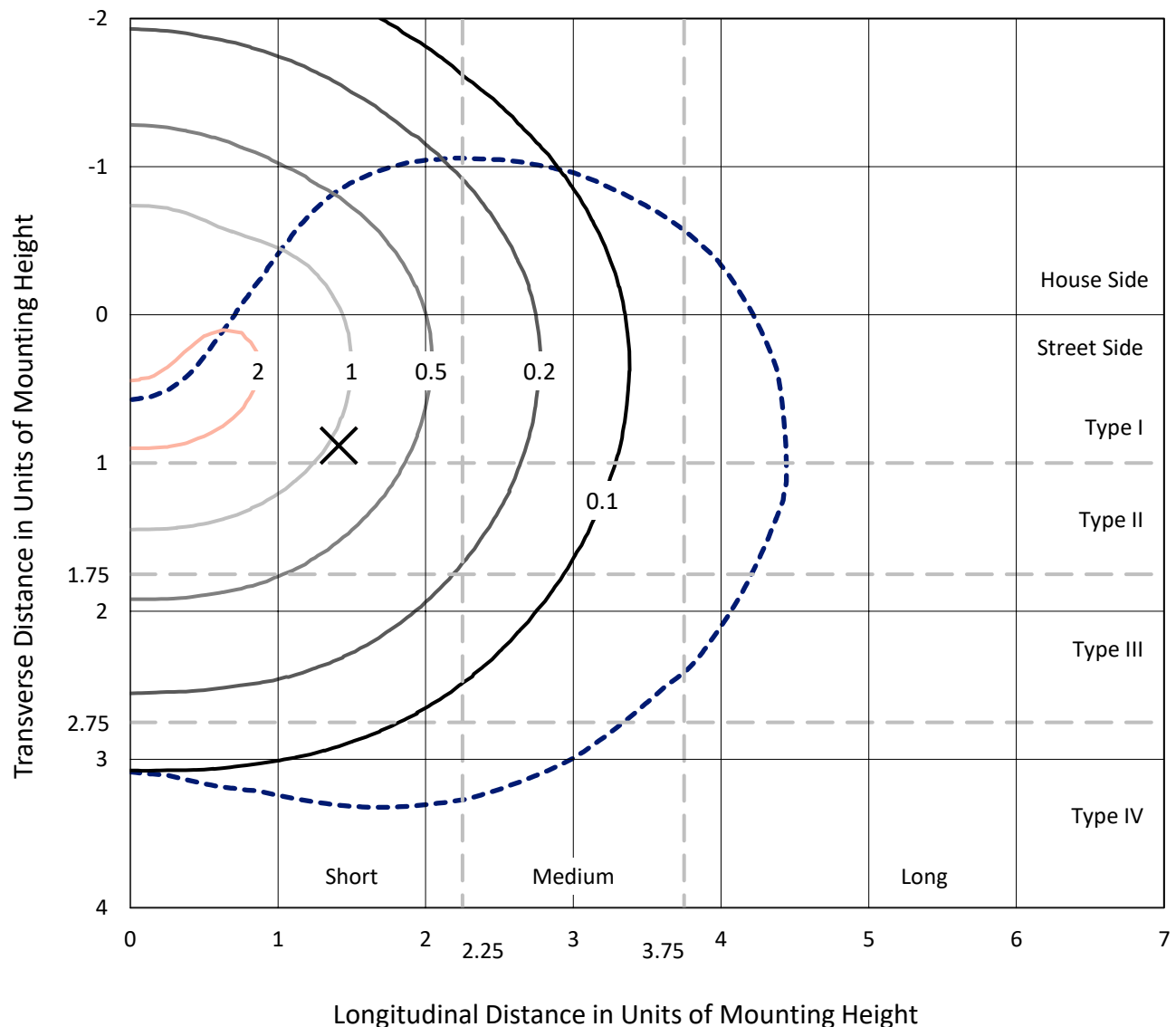
Input Watts (W): 39.2  
Input Voltage (V): 120  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 25 FT

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CATALOG NUMBER: CCP-VA-2-850-U-T4W

## Iso-Footcandle Lines of Horizontal Illumination

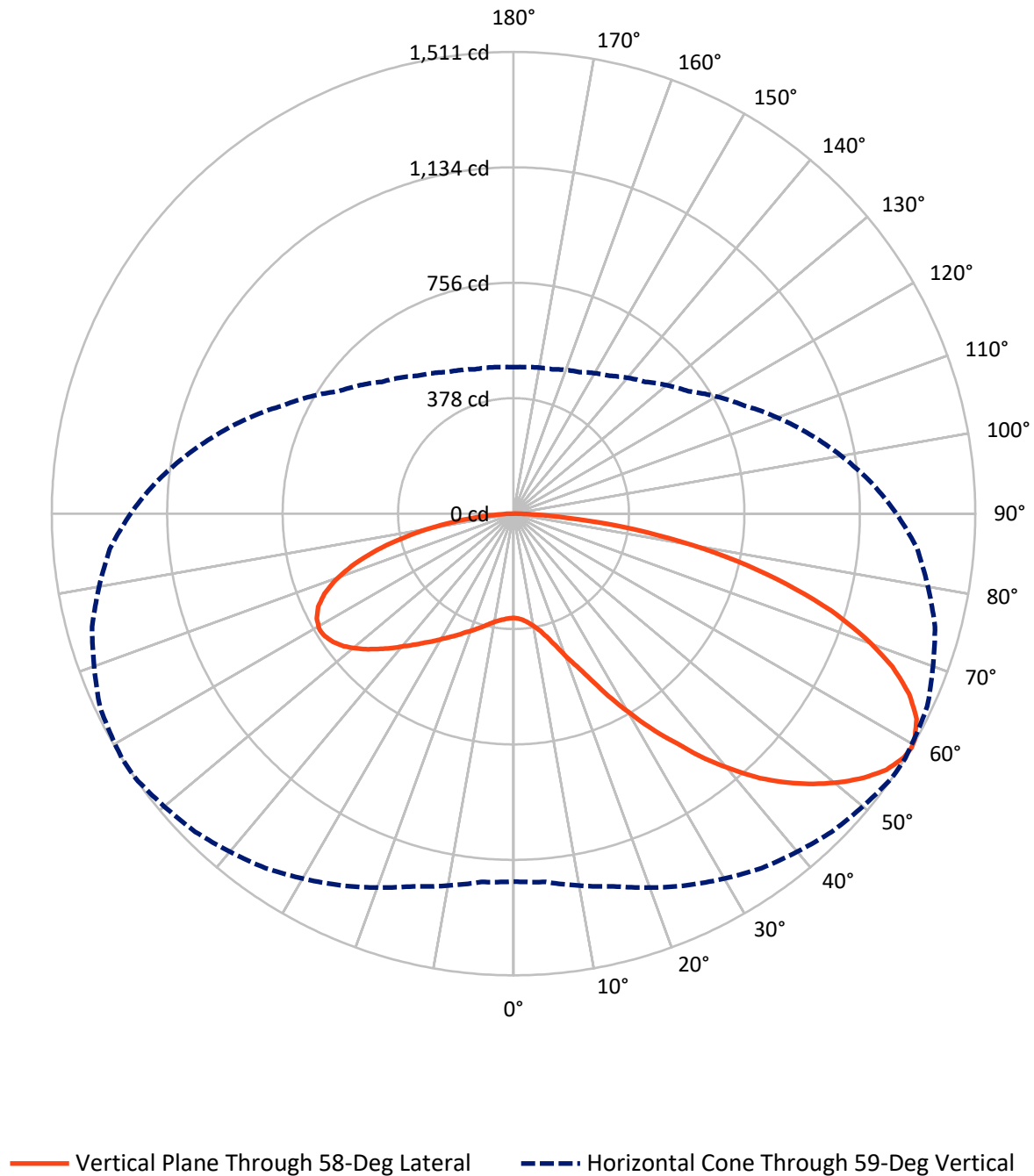
✕ Max cd  
 - - - 1/2 Max cd



Based on 15 foot mounting height. Maximum calculated value = 2.3 fc  
 Type IV - Short - N/A

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## Luminous Intensity Polar Plot



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CATALOG NUMBER: CCP-VA-2-850-U-T4W

**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 1518.9   | 0.0    | 1518.9 |
|                    | % Fixture | 35.7     | 0.0    | 35.7   |
| <b>Street Side</b> | Lumens    | 2740.0   | 0.0    | 2740.0 |
|                    | % Fixture | 64.3     | 0.0    | 64.3   |
| <b>Total</b>       | Lumens    | 4258.8   | 0.0    | 4258.8 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 33.9   | 0.8       |
| 10°-20°   | 115.5  | 2.7       |
| 20°-30°   | 243.8  | 5.7       |
| 30°-40°   | 448.7  | 10.5      |
| 40°-50°   | 699.4  | 16.4      |
| 50°-60°   | 919.1  | 21.6      |
| 60°-70°   | 963.0  | 22.6      |
| 70°-80°   | 667.7  | 15.7      |
| 80°-90°   | 167.7  | 3.9       |
| 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°    | 4258.8 | 100.0     |
| 0°-180°   | 4258.8 | 100.0     |

**Coefficient of Utilization**



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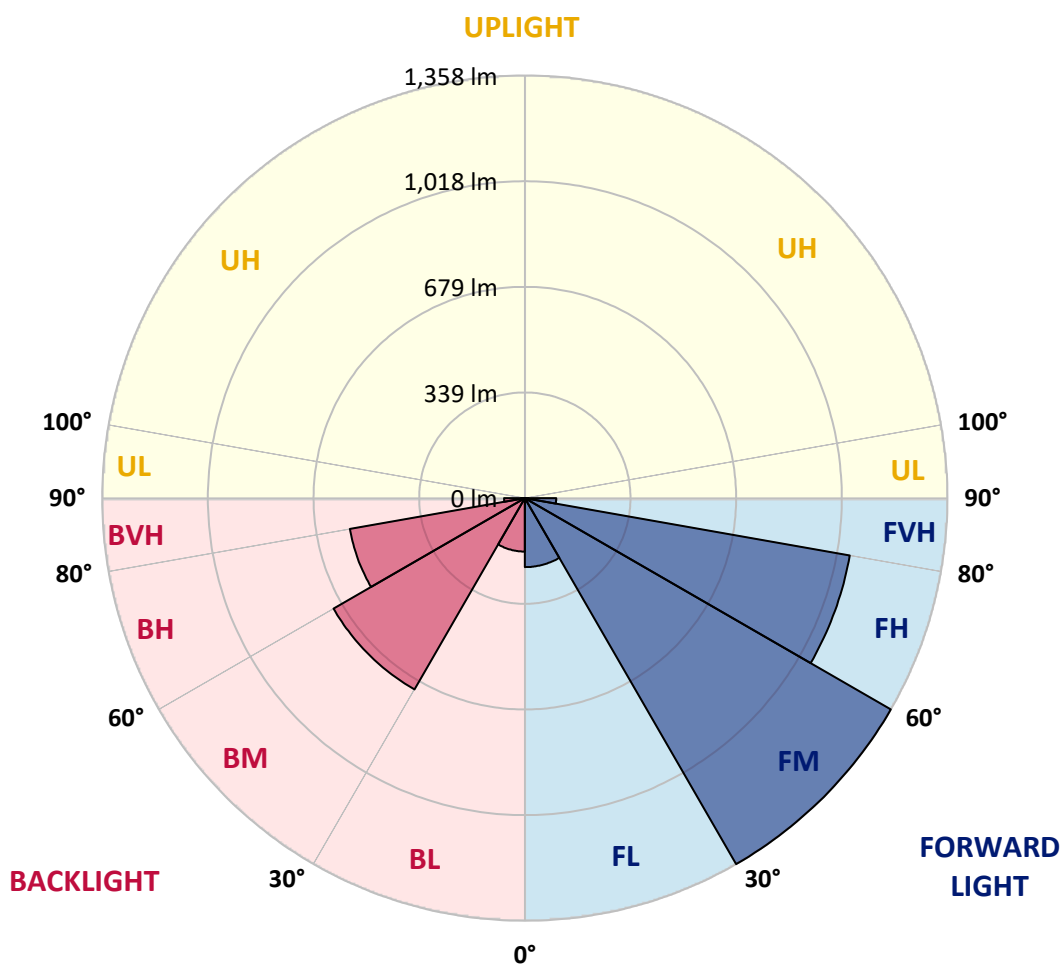
CATALOG NUMBER: CCP-VA-2-850-U-T4W

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 221.6  | 5.2       |                         |      |         |
| FM   | (30°-60°)   | 1357.6 | 31.9      |                         |      |         |
| FH   | (60°-80°)   | 1060.0 | 24.9      |                         |      | G1/1800 |
| FVH  | (80°-90°)   | 100.7  | 2.4       |                         |      | G2/225  |
| BL   | (0°-30°)    | 171.7  | 4.0       | B1/500                  |      |         |
| BM   | (30°-60°)   | 709.6  | 16.7      | B1/1000                 |      |         |
| BH   | (60°-80°)   | 570.7  | 13.4      | B2/1000                 |      | G2/1000 |
| BVH  | (80°-90°)   | 66.9   | 1.6       |                         |      | G1/100  |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B2-U0-G2**

Type IV Short



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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°    | 58°    | 65°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 341.4  | 341.4  | 341.4  | 341.4  | 341.4  | 341.4  | 341.4  | 341.4  | 341.4  | 341.4  | 341.4  |
| 2.5°  | 346.2  | 346.2  | 346.2  | 345.2  | 345.2  | 345.2  | 344.3  | 344.3  | 344.3  | 343.3  | 342.4  |
| 5°    | 353.9  | 353.9  | 352.9  | 353.9  | 352.9  | 352.0  | 351.0  | 351.0  | 351.0  | 350.0  | 349.1  |
| 7.5°  | 364.4  | 365.4  | 364.4  | 365.4  | 364.4  | 363.5  | 361.5  | 361.5  | 360.6  | 358.7  | 356.8  |
| 10°   | 380.7  | 380.7  | 380.7  | 379.8  | 378.8  | 377.9  | 376.9  | 375.9  | 375.0  | 372.1  | 369.2  |
| 12.5° | 400.9  | 400.9  | 400.9  | 399.0  | 399.0  | 397.0  | 396.1  | 395.1  | 393.2  | 389.4  | 385.5  |
| 15°   | 425.8  | 424.8  | 427.7  | 427.7  | 426.8  | 426.8  | 423.9  | 422.0  | 420.0  | 414.3  | 405.7  |
| 17.5° | 459.4  | 458.4  | 461.3  | 463.2  | 463.2  | 464.2  | 459.4  | 457.5  | 450.7  | 443.1  | 431.6  |
| 20°   | 504.4  | 502.5  | 505.4  | 507.3  | 505.4  | 507.3  | 502.5  | 503.5  | 493.9  | 480.5  | 462.2  |
| 22.5° | 553.4  | 553.4  | 556.2  | 556.2  | 557.2  | 559.1  | 553.4  | 550.5  | 542.8  | 523.6  | 500.6  |
| 25°   | 613.8  | 618.6  | 618.6  | 618.6  | 622.4  | 623.4  | 617.6  | 612.8  | 602.3  | 576.4  | 544.7  |
| 27.5° | 687.6  | 686.7  | 685.7  | 691.5  | 691.5  | 693.4  | 689.5  | 687.6  | 675.1  | 643.5  | 595.5  |
| 30°   | 766.3  | 760.5  | 764.3  | 766.3  | 770.1  | 773.0  | 769.1  | 763.4  | 748.0  | 713.5  | 654.0  |
| 32.5° | 838.2  | 842.0  | 847.8  | 849.7  | 855.4  | 856.4  | 846.8  | 846.8  | 831.5  | 787.4  | 726.0  |
| 35°   | 919.7  | 919.7  | 935.0  | 941.8  | 941.8  | 947.5  | 933.1  | 925.5  | 914.9  | 868.9  | 791.2  |
| 37.5° | 990.7  | 992.6  | 1005.0 | 1020.4 | 1022.3 | 1030.9 | 1020.4 | 1017.5 | 998.3  | 951.3  | 865.0  |
| 40°   | 1056.8 | 1058.8 | 1074.1 | 1092.3 | 1102.9 | 1116.3 | 1105.7 | 1101.0 | 1080.8 | 1027.1 | 938.9  |
| 42.5° | 1108.6 | 1112.5 | 1131.6 | 1158.5 | 1175.8 | 1192.1 | 1187.3 | 1184.4 | 1156.6 | 1100.0 | 1007.0 |
| 45°   | 1147.9 | 1154.7 | 1181.5 | 1213.2 | 1237.1 | 1261.1 | 1262.1 | 1256.3 | 1230.4 | 1167.1 | 1073.1 |
| 47.5° | 1179.6 | 1187.3 | 1217.0 | 1257.3 | 1293.7 | 1323.4 | 1329.2 | 1322.5 | 1298.5 | 1232.3 | 1132.6 |
| 50°   | 1205.5 | 1209.3 | 1242.9 | 1294.7 | 1339.7 | 1377.1 | 1388.7 | 1382.9 | 1361.8 | 1287.0 | 1184.4 |
| 52.5° | 1218.9 | 1224.7 | 1263.0 | 1322.5 | 1377.1 | 1422.2 | 1439.5 | 1436.6 | 1411.7 | 1336.9 | 1230.4 |
| 55°   | 1225.6 | 1231.4 | 1276.5 | 1344.5 | 1405.9 | 1458.7 | 1479.8 | 1480.7 | 1456.7 | 1381.9 | 1273.6 |
| 57.5° | 1218.0 | 1225.6 | 1274.5 | 1350.3 | 1418.4 | 1475.0 | 1507.6 | 1506.6 | 1487.4 | 1416.5 | 1310.0 |
| 59°   | 1204.5 | 1210.3 | 1263.0 | 1342.6 | 1416.5 | 1473.0 | 1510.5 | 1511.4 | 1494.1 | 1428.0 | 1326.3 |
| 60°   | 1189.2 | 1195.9 | 1249.6 | 1333.0 | 1408.8 | 1466.3 | 1505.7 | 1507.6 | 1493.2 | 1430.9 | 1333.0 |
| 62.5° | 1136.4 | 1145.1 | 1204.5 | 1293.7 | 1376.2 | 1430.9 | 1477.8 | 1480.7 | 1473.0 | 1423.2 | 1337.8 |
| 65°   | 1062.6 | 1070.3 | 1134.5 | 1229.5 | 1315.8 | 1372.4 | 1416.5 | 1423.2 | 1422.2 | 1388.7 | 1318.6 |
| 67.5° | 972.4  | 973.4  | 1033.8 | 1137.4 | 1227.5 | 1283.2 | 1325.4 | 1336.9 | 1345.5 | 1323.4 | 1262.1 |
| 70°   | 864.1  | 863.1  | 921.6  | 1024.2 | 1114.4 | 1172.9 | 1215.1 | 1222.7 | 1244.8 | 1227.5 | 1177.7 |
| 72.5° | 729.8  | 741.3  | 796.0  | 882.3  | 971.5  | 1036.7 | 1074.1 | 1088.5 | 1101.0 | 1104.8 | 1063.5 |
| 75°   | 603.2  | 615.7  | 658.8  | 739.4  | 816.1  | 876.5  | 916.8  | 923.5  | 946.5  | 952.3  | 913.9  |
| 77.5° | 482.4  | 483.3  | 515.0  | 579.2  | 649.3  | 699.1  | 731.7  | 749.0  | 761.5  | 773.0  | 732.7  |
| 80°   | 338.5  | 343.3  | 365.4  | 411.4  | 466.1  | 518.8  | 545.7  | 557.2  | 565.8  | 573.5  | 560.1  |
| 82.5° | 211.9  | 213.9  | 228.2  | 256.1  | 293.5  | 323.2  | 351.0  | 360.6  | 362.5  | 379.8  | 377.9  |
| 85°   | 100.7  | 101.7  | 111.2  | 124.7  | 141.0  | 165.0  | 175.5  | 175.5  | 188.9  | 201.4  | 201.4  |
| 87.5° | 13.4   | 13.4   | 16.3   | 18.2   | 23.0   | 29.7   | 41.2   | 42.2   | 49.9   | 55.6   | 60.4   |
| 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: CCP-VA-2-850-U-T4W

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°  | 125°  | 135°  | 145°  | 155°  | 165°  | 175°  | 180°  |
|-------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0°    | 341.4  | 341.4  | 341.4  | 341.4 | 341.4 | 341.4 | 341.4 | 341.4 | 341.4 | 341.4 | 341.4 |
| 2.5°  | 342.4  | 342.4  | 342.4  | 342.4 | 342.4 | 341.4 | 342.4 | 342.4 | 342.4 | 342.4 | 342.4 |
| 5°    | 349.1  | 348.1  | 347.2  | 346.2 | 346.2 | 345.2 | 345.2 | 345.2 | 345.2 | 345.2 | 345.2 |
| 7.5°  | 355.8  | 354.8  | 353.9  | 352.0 | 351.0 | 350.0 | 350.0 | 349.1 | 349.1 | 349.1 | 349.1 |
| 10°   | 367.3  | 366.3  | 362.5  | 359.6 | 357.7 | 356.8 | 355.8 | 354.8 | 353.9 | 353.9 | 353.9 |
| 12.5° | 382.6  | 380.7  | 374.0  | 370.2 | 367.3 | 365.4 | 363.5 | 362.5 | 361.5 | 360.6 | 360.6 |
| 15°   | 401.8  | 397.0  | 388.4  | 382.6 | 378.8 | 375.9 | 373.1 | 371.1 | 370.2 | 369.2 | 369.2 |
| 17.5° | 424.8  | 419.1  | 407.6  | 397.0 | 390.3 | 385.5 | 381.7 | 378.8 | 377.9 | 377.9 | 377.9 |
| 20°   | 453.6  | 444.0  | 427.7  | 413.3 | 402.8 | 396.1 | 390.3 | 387.4 | 386.5 | 385.5 | 384.6 |
| 22.5° | 487.2  | 474.7  | 450.7  | 428.7 | 415.3 | 405.7 | 399.0 | 395.1 | 392.2 | 391.3 | 391.3 |
| 25°   | 525.5  | 507.3  | 475.7  | 448.8 | 430.6 | 417.2 | 408.5 | 403.7 | 399.0 | 397.0 | 397.0 |
| 27.5° | 571.6  | 547.6  | 505.4  | 469.9 | 445.0 | 428.7 | 419.1 | 412.4 | 407.6 | 403.7 | 401.8 |
| 30°   | 621.4  | 594.6  | 538.0  | 492.9 | 461.3 | 443.1 | 431.6 | 423.9 | 417.2 | 410.5 | 409.5 |
| 32.5° | 684.7  | 646.4  | 577.3  | 518.8 | 480.5 | 457.5 | 444.0 | 434.4 | 425.8 | 419.1 | 417.2 |
| 35°   | 749.0  | 703.0  | 618.6  | 545.7 | 498.7 | 470.9 | 454.6 | 444.0 | 435.4 | 427.7 | 426.8 |
| 37.5° | 815.2  | 766.3  | 663.6  | 577.3 | 519.8 | 486.2 | 466.1 | 454.6 | 444.0 | 436.4 | 435.4 |
| 40°   | 884.2  | 826.7  | 709.7  | 609.9 | 541.8 | 501.6 | 478.5 | 464.2 | 452.7 | 445.9 | 445.0 |
| 42.5° | 949.4  | 887.1  | 759.5  | 648.3 | 567.7 | 517.9 | 491.0 | 475.7 | 461.3 | 454.6 | 453.6 |
| 45°   | 1011.8 | 944.6  | 809.4  | 683.8 | 593.6 | 535.1 | 503.5 | 485.3 | 469.9 | 463.2 | 462.2 |
| 47.5° | 1068.3 | 1001.2 | 855.4  | 722.1 | 620.5 | 554.3 | 516.9 | 494.9 | 477.6 | 470.9 | 470.9 |
| 50°   | 1119.2 | 1049.2 | 900.5  | 757.6 | 645.4 | 573.5 | 528.4 | 503.5 | 486.2 | 479.5 | 478.5 |
| 52.5° | 1167.1 | 1091.4 | 939.8  | 788.3 | 669.4 | 590.8 | 539.9 | 510.2 | 492.0 | 484.3 | 483.3 |
| 55°   | 1205.5 | 1129.7 | 972.4  | 813.2 | 685.7 | 602.3 | 547.6 | 514.0 | 493.9 | 487.2 | 486.2 |
| 57.5° | 1239.0 | 1161.4 | 995.5  | 830.5 | 696.2 | 609.0 | 551.4 | 514.0 | 492.9 | 485.3 | 484.3 |
| 59°   | 1253.4 | 1174.8 | 1003.1 | 835.3 | 698.2 | 609.9 | 550.5 | 511.2 | 489.1 | 481.4 | 479.5 |
| 60°   | 1261.1 | 1180.5 | 1006.0 | 836.3 | 697.2 | 608.0 | 549.5 | 508.3 | 485.3 | 476.6 | 476.6 |
| 62.5° | 1268.8 | 1185.3 | 1002.2 | 828.6 | 686.7 | 597.5 | 539.9 | 496.8 | 470.9 | 461.3 | 461.3 |
| 65°   | 1252.5 | 1168.1 | 980.1  | 807.5 | 665.6 | 579.2 | 521.7 | 477.6 | 448.8 | 439.2 | 439.2 |
| 67.5° | 1204.5 | 1125.9 | 939.8  | 768.2 | 631.0 | 547.6 | 492.0 | 446.9 | 420.0 | 409.5 | 406.6 |
| 70°   | 1123.0 | 1056.8 | 876.5  | 711.6 | 584.0 | 507.3 | 454.6 | 411.4 | 383.6 | 373.1 | 369.2 |
| 72.5° | 1013.7 | 948.5  | 792.1  | 642.5 | 521.7 | 454.6 | 408.5 | 367.3 | 336.6 | 326.1 | 327.0 |
| 75°   | 863.1  | 817.1  | 682.8  | 555.3 | 449.8 | 387.4 | 349.1 | 314.6 | 288.7 | 280.0 | 281.0 |
| 77.5° | 700.1  | 661.7  | 553.4  | 452.7 | 367.3 | 319.4 | 286.7 | 258.9 | 241.7 | 236.9 | 234.0 |
| 80°   | 536.1  | 498.7  | 415.3  | 337.6 | 279.1 | 245.5 | 223.5 | 204.3 | 190.8 | 184.1 | 186.0 |
| 82.5° | 359.6  | 336.6  | 275.2  | 223.5 | 189.9 | 165.9 | 158.2 | 145.8 | 141.0 | 137.1 | 140.0 |
| 85°   | 193.7  | 173.6  | 143.9  | 119.9 | 104.5 | 97.8  | 99.7  | 98.8  | 94.9  | 94.0  | 96.9  |
| 87.5° | 63.3   | 54.7   | 42.2   | 35.5  | 36.4  | 32.6  | 32.6  | 30.7  | 27.8  | 26.9  | 28.8  |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |

Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

INVUE

Report Number: SP1-2005-785-19

Luminaire Tested: WIS-VA-3-850-U-T4FT

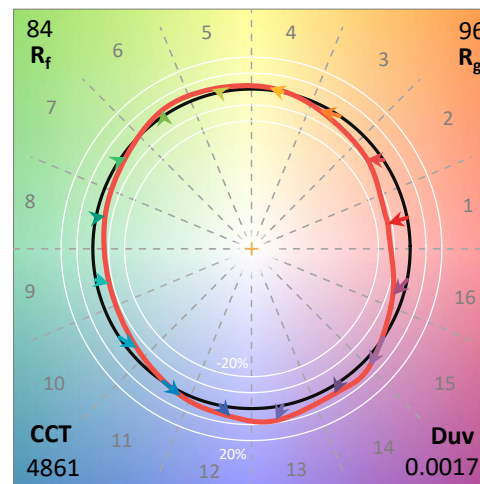
Test Date: 09/04/2020

### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2005-785-19  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1  
 Measurement Geometry:  $4\pi$   
 Issue Date: 09/04/2020  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: INVUE  
 Catalog Number: **WIS-VA-3-850-U-T4FT**  
 Description: INVUE WALL PACK VA

### Spectral Parameters

|                           |        |           |      |      |      |
|---------------------------|--------|-----------|------|------|------|
| CCT (K):                  | 4861   | CRI (Ra): | 83.0 |      |      |
| CIE u':                   | 0.2117 | R1:       | 80.6 | R9:  | 4.8  |
| CIE v':                   | 0.4887 | R2:       | 88.5 | R10: | 73.3 |
| Duv:                      | 0.0017 | R3:       | 94.3 | R11: | 81.6 |
| CIE x:                    | 0.3495 | R4:       | 82.2 | R12: | 62.1 |
| CIE y:                    | 0.3586 | R5:       | 81.5 | R13: | 82.7 |
| CIE z:                    | 0.2920 | R6:       | 84.0 | R14: | 97.2 |
| Peak Wavelength (nm):     | 451    | R7:       | 86.9 |      |      |
| Dominant Wavelength (nm): | 572    | R8:       | 65.9 |      |      |
| Purity:                   | 12.5   |           |      |      |      |
|                           |        |           |      |      |      |
| Rf:                       | 84.2   |           |      |      |      |
| Rg:                       | 96.2   |           |      |      |      |



### Test Conditions

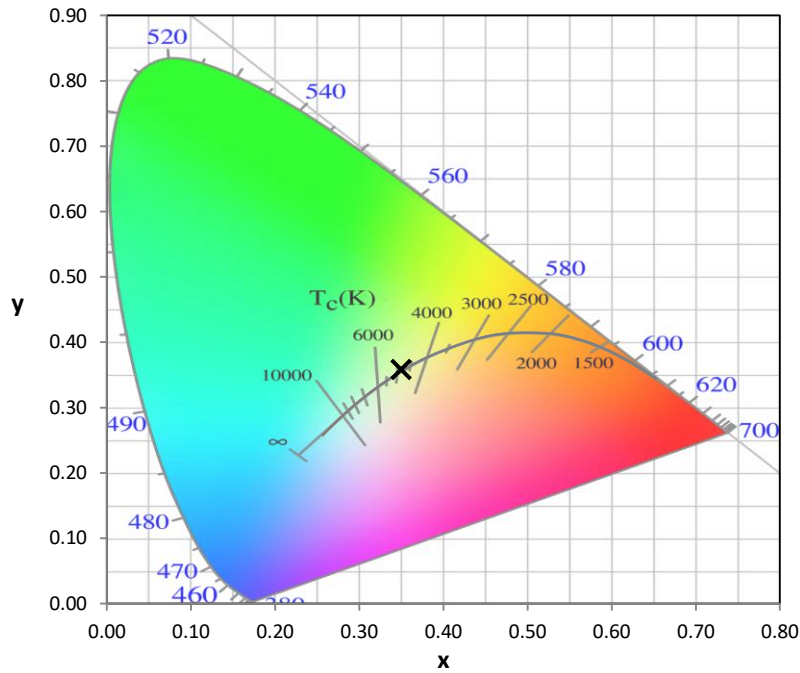
Stabilization Time: 114M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.1/47%  
 Sphere Temperature (°C): 24.3

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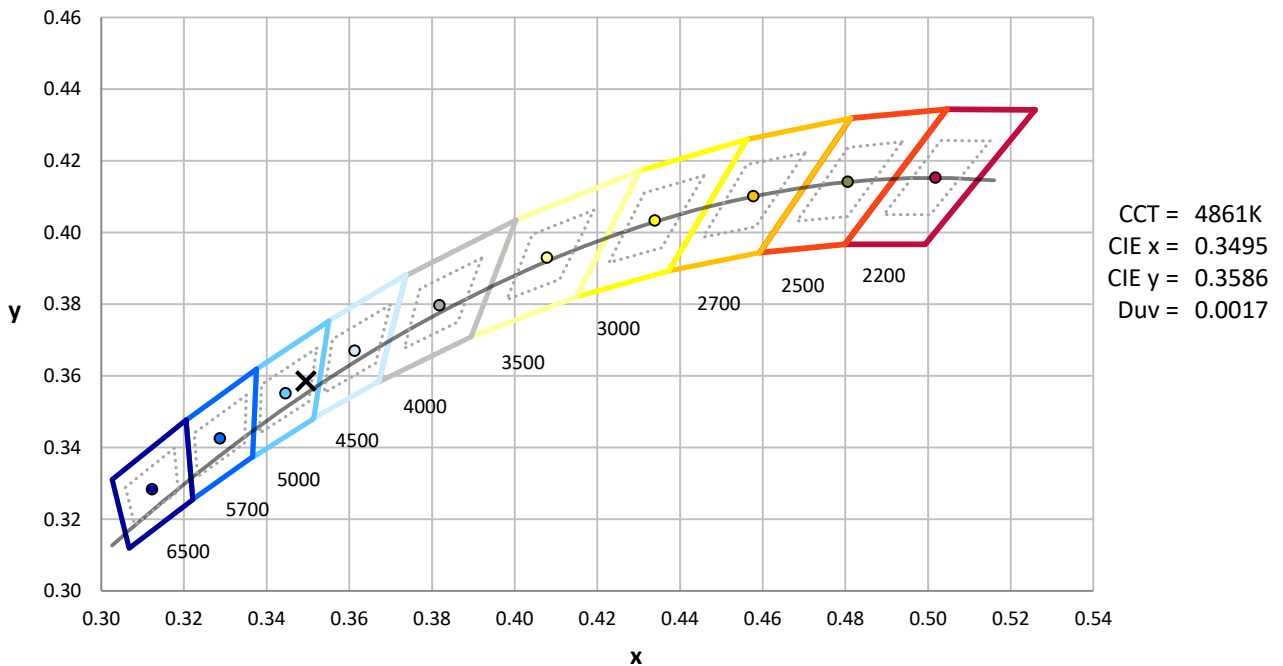
| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 7/29/2020        | 1/29/2021            |
| Power Meter                    | IN0071                | 12/3/2020        | 12/3/2020            |
| AC Power Source                | IN0063                | 12/3/2020        | 12/3/2020            |
| DC Power Source                | IN0208                | 12/3/2020        | 12/3/2020            |
| Sphere Thermometer             | IN0085                | 12/3/2020        | 12/3/2020            |
| Room Thermometer               | IN0046                | 12/3/2020        | 12/3/2020            |

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**CIE 1931 Chromaticity Diagram**



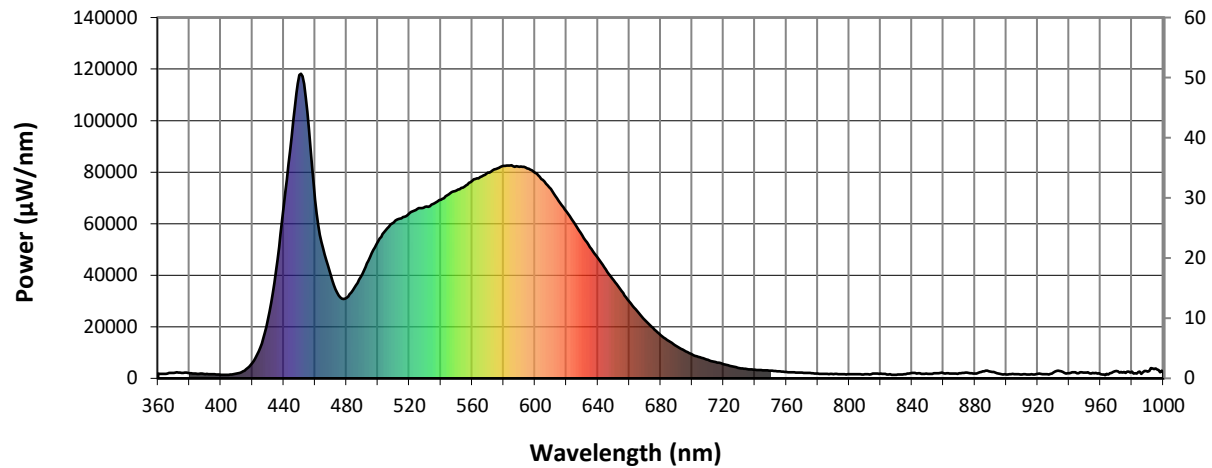
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 5000K 4-step quadrangle

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### Photopic Flux vs. Wavelength

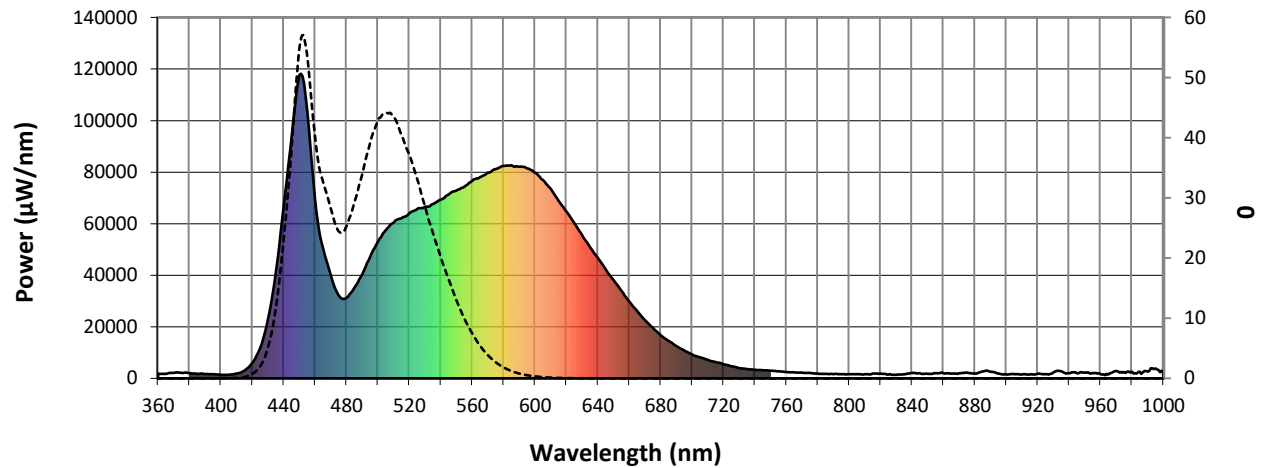


#####

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1906             | 0.0              | 490       | 40491            | 5.8              | 620       | 64664            | 16.8             | 750       | 2971             | 0.0              | 880       | 1858             | 0.0              |
| 365       | 1759             | 0.0              | 495       | 47079            | 8.5              | 625       | 60381            | 13.3             | 755       | 2690             | 0.0              | 885       | 2764             | 0.0              |
| 370       | 2126             | 0.0              | 500       | 53082            | 11.7             | 630       | 55496            | 10.0             | 760       | 2509             | 0.0              | 890       | 2640             | 0.0              |
| 375       | 2177             | 0.0              | 505       | 57523            | 16.1             | 635       | 50919            | 7.7              | 765       | 2369             | 0.0              | 895       | 1901             | 0.0              |
| 380       | 2019             | 0.0              | 510       | 60448            | 20.8             | 640       | 46664            | 5.6              | 770       | 2245             | 0.0              | 900       | 1469             | 0.0              |
| 385       | 1761             | 0.0              | 515       | 62070            | 25.7             | 645       | 42219            | 4.1              | 775       | 2066             | 0.0              | 905       | 1570             | 0.0              |
| 390       | 1678             | 0.0              | 520       | 64089            | 31.1             | 650       | 38080            | 2.8              | 780       | 1825             | 0.0              | 910       | 1535             | 0.0              |
| 395       | 1623             | 0.0              | 525       | 65620            | 35.2             | 655       | 33941            | 1.9              | 785       | 1788             | 0.0              | 915       | 1555             | 0.0              |
| 400       | 1370             | 0.0              | 530       | 66569            | 39.2             | 660       | 29746            | 1.2              | 790       | 1673             | 0.0              | 920       | 1735             | 0.0              |
| 405       | 1392             | 0.0              | 535       | 67658            | 42.0             | 665       | 26069            | 0.8              | 795       | 1619             | 0.0              | 925       | 1657             | 0.0              |
| 410       | 1850             | 0.0              | 540       | 69290            | 45.1             | 670       | 22577            | 0.5              | 800       | 1623             | 0.0              | 930       | 2191             | 0.0              |
| 415       | 3042             | 0.0              | 545       | 71398            | 47.5             | 675       | 19574            | 0.3              | 805       | 1636             | 0.0              | 935       | 2723             | 0.0              |
| 420       | 5981             | 0.0              | 550       | 72885            | 49.5             | 680       | 16809            | 0.2              | 810       | 1572             | 0.0              | 940       | 2021             | 0.0              |
| 425       | 11951            | 0.1              | 555       | 74383            | 50.8             | 685       | 14514            | 0.1              | 815       | 1897             | 0.0              | 945       | 2000             | 0.0              |
| 430       | 22948            | 0.2              | 560       | 76586            | 52.0             | 690       | 12556            | 0.1              | 820       | 1843             | 0.0              | 950       | 2253             | 0.0              |
| 435       | 41653            | 0.5              | 565       | 78157            | 52.0             | 695       | 10840            | 0.0              | 825       | 1524             | 0.0              | 955       | 2081             | 0.0              |
| 440       | 66672            | 1.0              | 570       | 79792            | 51.9             | 700       | 9276             | 0.0              | 830       | 1409             | 0.0              | 960       | 1660             | 0.0              |
| 445       | 93771            | 2.0              | 575       | 81193            | 50.5             | 705       | 8180             | 0.0              | 835       | 1565             | 0.0              | 965       | 1543             | 0.0              |
| 450       | 117673           | 3.1              | 580       | 82419            | 49.0             | 710       | 7176             | 0.0              | 840       | 2101             | 0.0              | 970       | 2855             | 0.0              |
| 455       | 103475           | 3.5              | 585       | 82687            | 45.9             | 715       | 6338             | 0.0              | 845       | 1941             | 0.0              | 975       | 2442             | 0.0              |
| 460       | 69370            | 2.8              | 590       | 82076            | 42.4             | 720       | 5500             | 0.0              | 850       | 1751             | 0.0              | 980       | 2605             | 0.0              |
| 465       | 50527            | 2.6              | 595       | 81503            | 38.6             | 725       | 4714             | 0.0              | 855       | 1997             | 0.0              | 985       | 2589             | 0.0              |
| 470       | 39761            | 2.5              | 600       | 79756            | 34.4             | 730       | 4031             | 0.0              | 860       | 1954             | 0.0              | 990       | 2640             | 0.0              |
| 475       | 32129            | 2.5              | 605       | 76933            | 29.8             | 735       | 3633             | 0.0              | 865       | 1875             | 0.0              | 995       | 3795             | 0.0              |
| 480       | 31331            | 3.0              | 610       | 73443            | 25.2             | 740       | 3315             | 0.0              | 870       | 2004             | 0.0              | 1000      | 2221             | 0.0              |
| 485       | 35183            | 4.2              | 615       | 68862            | 20.8             | 745       | 3104             | 0.0              | 875       | 2299             | 0.0              |           |                  |                  |

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### Scotopic Flux vs. Wavelength



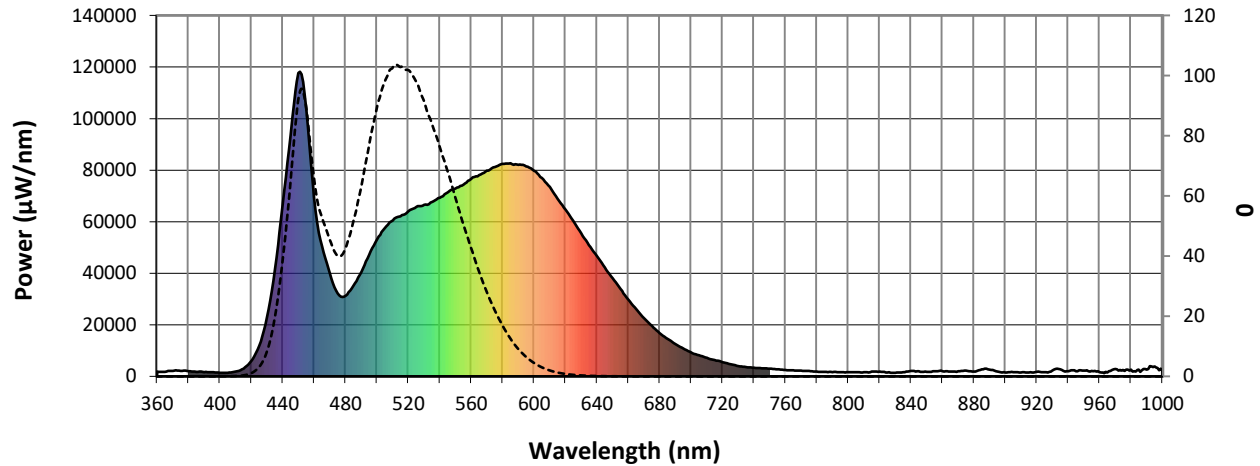
Scotopic Lumens: 4096.7

S/P: 0.81

| $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\Phi/\text{nm}$ ) |
|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|
| 360               | 1906                          | 0.0                            | 490               | 40491                         | 62.4                           | 620               | 64664                         | 0.8                            | 750               | 2971                          | 0.0                            | 880               | 1858                          | 0.0                            |
| 365               | 1759                          | 0.0                            | 495               | 47079                         | 76.1                           | 625               | 60381                         | 0.5                            | 755               | 2690                          | 0.0                            | 885               | 2764                          | 0.0                            |
| 370               | 2126                          | 0.0                            | 500               | 53082                         | 88.8                           | 630               | 55496                         | 0.3                            | 760               | 2509                          | 0.0                            | 890               | 2640                          | 0.0                            |
| 375               | 2177                          | 0.0                            | 505               | 57523                         | 97.8                           | 635               | 50919                         | 0.2                            | 765               | 2369                          | 0.0                            | 895               | 1901                          | 0.0                            |
| 380               | 2019                          | 0.0                            | 510               | 60448                         | 102.5                          | 640               | 46664                         | 0.1                            | 770               | 2245                          | 0.0                            | 900               | 1469                          | 0.0                            |
| 385               | 1761                          | 0.0                            | 515               | 62070                         | 102.9                          | 645               | 42219                         | 0.1                            | 775               | 2066                          | 0.0                            | 905               | 1570                          | 0.0                            |
| 390               | 1678                          | 0.0                            | 520               | 64089                         | 101.9                          | 650               | 38080                         | 0.0                            | 780               | 1825                          | 0.0                            | 910               | 1535                          | 0.0                            |
| 395               | 1623                          | 0.0                            | 525               | 65620                         | 98.2                           | 655               | 33941                         | 0.0                            | 785               | 1788                          | 0.0                            | 915               | 1555                          | 0.0                            |
| 400               | 1370                          | 0.0                            | 530               | 66569                         | 91.8                           | 660               | 29746                         | 0.0                            | 790               | 1673                          | 0.0                            | 920               | 1735                          | 0.0                            |
| 405               | 1392                          | 0.0                            | 535               | 67658                         | 84.3                           | 665               | 26069                         | 0.0                            | 795               | 1619                          | 0.0                            | 925               | 1657                          | 0.0                            |
| 410               | 1850                          | 0.1                            | 540               | 69290                         | 76.6                           | 670               | 22577                         | 0.0                            | 800               | 1623                          | 0.0                            | 930               | 2191                          | 0.0                            |
| 415               | 3042                          | 0.3                            | 545               | 71398                         | 68.5                           | 675               | 19574                         | 0.0                            | 805               | 1636                          | 0.0                            | 935               | 2723                          | 0.0                            |
| 420               | 5981                          | 1.0                            | 550               | 72885                         | 59.6                           | 680               | 16809                         | 0.0                            | 810               | 1572                          | 0.0                            | 940               | 2021                          | 0.0                            |
| 425               | 11951                         | 2.9                            | 555               | 74383                         | 50.8                           | 685               | 14514                         | 0.0                            | 815               | 1897                          | 0.0                            | 945               | 2000                          | 0.0                            |
| 430               | 22948                         | 7.8                            | 560               | 76586                         | 42.8                           | 690               | 12556                         | 0.0                            | 820               | 1843                          | 0.0                            | 950               | 2253                          | 0.0                            |
| 435               | 41653                         | 18.6                           | 565               | 78157                         | 35.1                           | 695               | 10840                         | 0.0                            | 825               | 1524                          | 0.0                            | 955               | 2081                          | 0.0                            |
| 440               | 66672                         | 37.3                           | 570               | 79792                         | 28.2                           | 700               | 9276                          | 0.0                            | 830               | 1409                          | 0.0                            | 960               | 1660                          | 0.0                            |
| 445               | 93771                         | 62.8                           | 575               | 81193                         | 22.1                           | 705               | 8180                          | 0.0                            | 835               | 1565                          | 0.0                            | 965               | 1543                          | 0.0                            |
| 450               | 117673                        | 91.2                           | 580               | 82419                         | 17.0                           | 710               | 7176                          | 0.0                            | 840               | 2101                          | 0.0                            | 970               | 2855                          | 0.0                            |
| 455               | 103475                        | 90.4                           | 585               | 82687                         | 12.6                           | 715               | 6338                          | 0.0                            | 845               | 1941                          | 0.0                            | 975               | 2442                          | 0.0                            |
| 460               | 69370                         | 67.0                           | 590               | 82076                         | 9.1                            | 720               | 5500                          | 0.0                            | 850               | 1751                          | 0.0                            | 980               | 2605                          | 0.0                            |
| 465               | 50527                         | 53.4                           | 595               | 81503                         | 6.5                            | 725               | 4714                          | 0.0                            | 855               | 1997                          | 0.0                            | 985               | 2589                          | 0.0                            |
| 470               | 39761                         | 45.8                           | 600               | 79756                         | 4.5                            | 730               | 4031                          | 0.0                            | 860               | 1954                          | 0.0                            | 990               | 2640                          | 0.0                            |
| 475               | 32129                         | 40.2                           | 605               | 76933                         | 3.0                            | 735               | 3633                          | 0.0                            | 865               | 1875                          | 0.0                            | 995               | 3795                          | 0.0                            |
| 480               | 31331                         | 42.3                           | 610               | 73443                         | 2.0                            | 740               | 3315                          | 0.0                            | 870               | 2004                          | 0.0                            | 1000              | 2221                          | 0.0                            |
| 485               | 35183                         | 51.0                           | 615               | 68862                         | 1.3                            | 745               | 3104                          | 0.0                            | 875               | 2299                          | 0.0                            |                   |                               |                                |

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### Melanopic Flux vs. Wavelength



Melanopic Lumens: 9800.7 S/P: 1.93

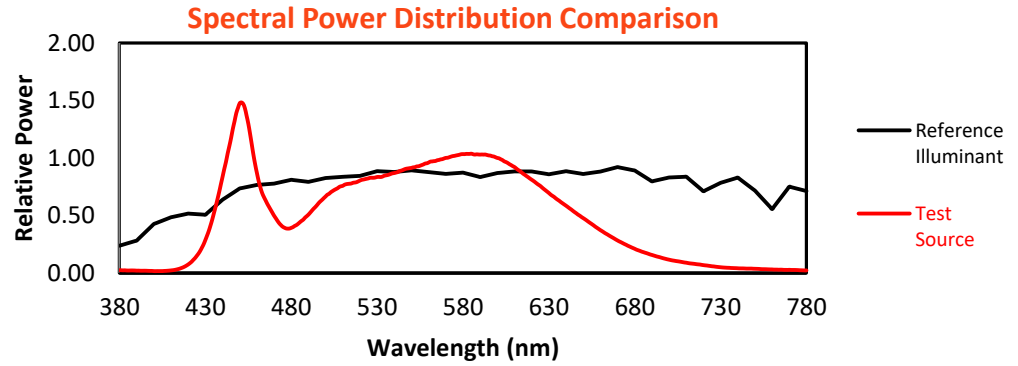
| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(Φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1906             | 0.0              | 490       | 40491            | 33.7             | 620       | 64664            | 0.1              | 750       | 2971             | 0.0              | 880       | 1858             | 0.0              |
| 365       | 1759             | 0.0              | 495       | 47079            | 38.9             | 625       | 60381            | 0.0              | 755       | 2690             | 0.0              | 885       | 2764             | 0.0              |
| 370       | 2126             | 0.0              | 500       | 53082            | 42.7             | 630       | 55496            | 0.0              | 760       | 2509             | 0.0              | 890       | 2640             | 0.0              |
| 375       | 2177             | 0.0              | 505       | 57523            | 44.1             | 635       | 50919            | 0.0              | 765       | 2369             | 0.0              | 895       | 1901             | 0.0              |
| 380       | 2019             | 0.0              | 510       | 60448            | 43.4             | 640       | 46664            | 0.0              | 770       | 2245             | 0.0              | 900       | 1469             | 0.0              |
| 385       | 1761             | 0.0              | 515       | 62070            | 40.6             | 645       | 42219            | 0.0              | 775       | 2066             | 0.0              | 905       | 1570             | 0.0              |
| 390       | 1678             | 0.0              | 520       | 64089            | 37.3             | 650       | 38080            | 0.0              | 780       | 1825             | 0.0              | 910       | 1535             | 0.0              |
| 395       | 1623             | 0.0              | 525       | 65620            | 33.3             | 655       | 33941            | 0.0              | 785       | 1788             | 0.0              | 915       | 1555             | 0.0              |
| 400       | 1370             | 0.0              | 530       | 66569            | 28.8             | 660       | 29746            | 0.0              | 790       | 1673             | 0.0              | 920       | 1735             | 0.0              |
| 405       | 1392             | 0.0              | 535       | 67658            | 24.4             | 665       | 26069            | 0.0              | 795       | 1619             | 0.0              | 925       | 1657             | 0.0              |
| 410       | 1850             | 0.1              | 540       | 69290            | 20.3             | 670       | 22577            | 0.0              | 800       | 1623             | 0.0              | 930       | 2191             | 0.0              |
| 415       | 3042             | 0.2              | 545       | 71398            | 16.6             | 675       | 19574            | 0.0              | 805       | 1636             | 0.0              | 935       | 2723             | 0.0              |
| 420       | 5981             | 0.7              | 550       | 72885            | 13.1             | 680       | 16809            | 0.0              | 810       | 1572             | 0.0              | 940       | 2021             | 0.0              |
| 425       | 11951            | 1.9              | 555       | 74383            | 10.0             | 685       | 14514            | 0.0              | 815       | 1897             | 0.0              | 945       | 2000             | 0.0              |
| 430       | 22948            | 4.8              | 560       | 76586            | 7.6              | 690       | 12556            | 0.0              | 820       | 1843             | 0.0              | 950       | 2253             | 0.0              |
| 435       | 41653            | 11.1             | 565       | 78157            | 5.5              | 695       | 10840            | 0.0              | 825       | 1524             | 0.0              | 955       | 2081             | 0.0              |
| 440       | 66672            | 22.3             | 570       | 79792            | 3.9              | 700       | 9276             | 0.0              | 830       | 1409             | 0.0              | 960       | 1660             | 0.0              |
| 445       | 93771            | 37.0             | 575       | 81193            | 2.7              | 705       | 8180             | 0.0              | 835       | 1565             | 0.0              | 965       | 1543             | 0.0              |
| 450       | 117673           | 54.2             | 580       | 82419            | 1.8              | 710       | 7176             | 0.0              | 840       | 2101             | 0.0              | 970       | 2855             | 0.0              |
| 455       | 103475           | 54.2             | 585       | 82687            | 1.2              | 715       | 6338             | 0.0              | 845       | 1941             | 0.0              | 975       | 2442             | 0.0              |
| 460       | 69370            | 40.9             | 590       | 82076            | 0.8              | 720       | 5500             | 0.0              | 850       | 1751             | 0.0              | 980       | 2605             | 0.0              |
| 465       | 50527            | 33.0             | 595       | 81503            | 0.5              | 725       | 4714             | 0.0              | 855       | 1997             | 0.0              | 985       | 2589             | 0.0              |
| 470       | 39761            | 28.5             | 600       | 79756            | 0.3              | 730       | 4031             | 0.0              | 860       | 1954             | 0.0              | 990       | 2640             | 0.0              |
| 475       | 32129            | 24.5             | 605       | 76933            | 0.2              | 735       | 3633             | 0.0              | 865       | 1875             | 0.0              | 995       | 3795             | 0.0              |
| 480       | 31331            | 25.2             | 610       | 73443            | 0.1              | 740       | 3315             | 0.0              | 870       | 2004             | 0.0              | 1000      | 2221             | 0.0              |
| 485       | 35183            | 29.0             | 615       | 68862            | 0.1              | 745       | 3104             | 0.0              | 875       | 2299             | 0.0              |           |                  |                  |

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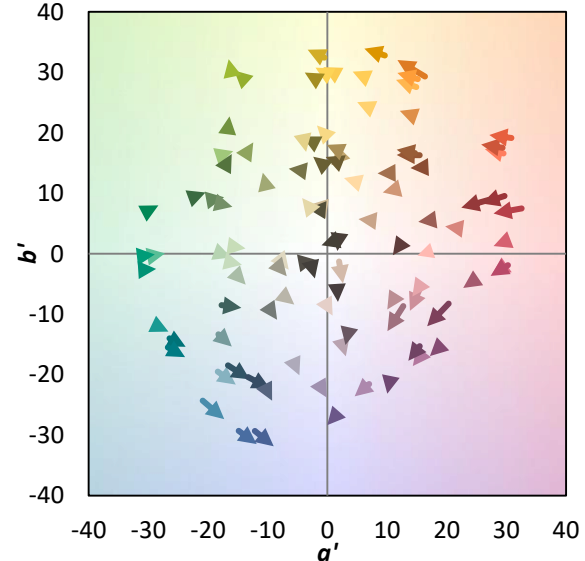
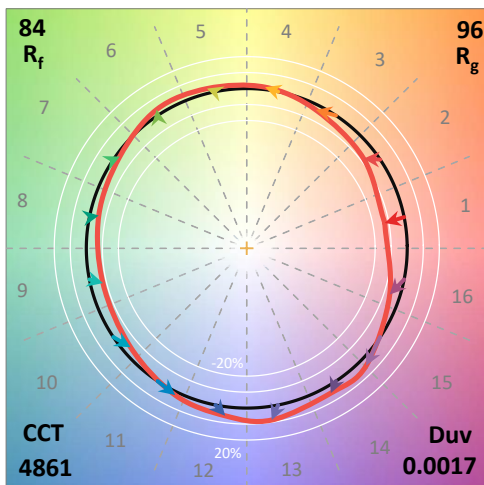
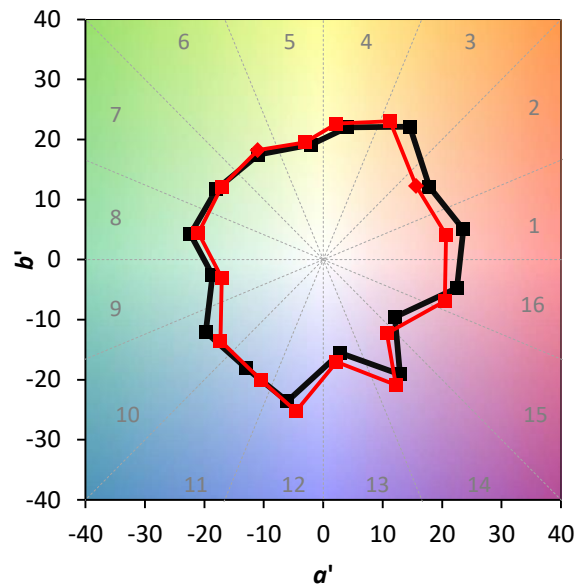
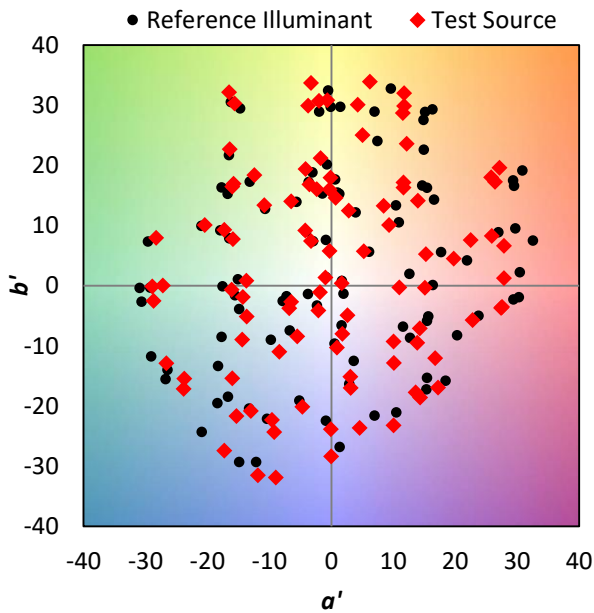
TM-30-18

### Summary

$R_f = 84.2$   
 $R_g = 96.2$   
 CIE  $R_a = 83.0$   
 $R_9 = 4.8$

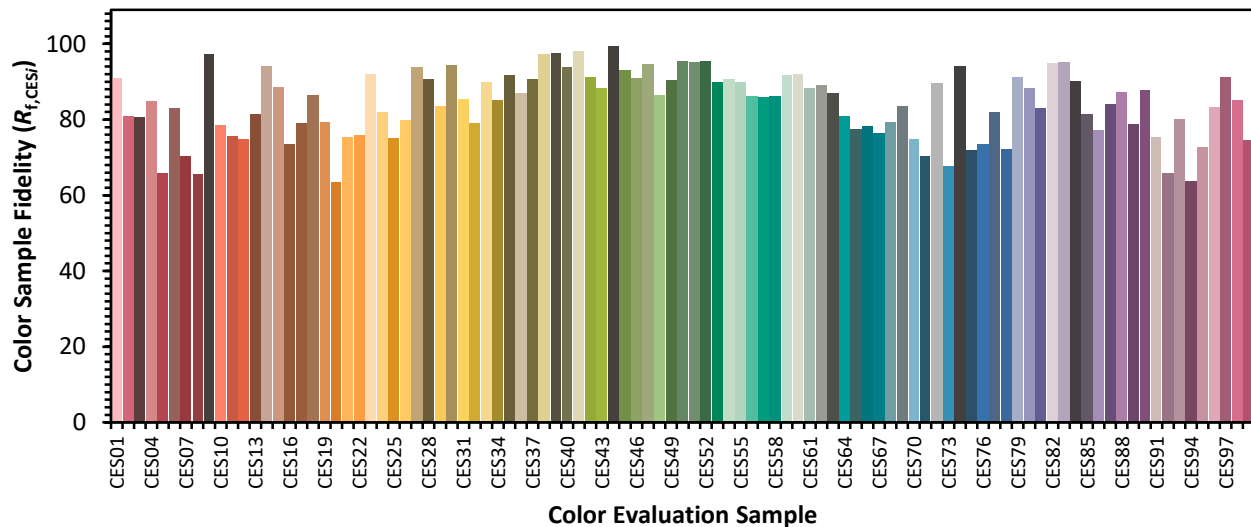


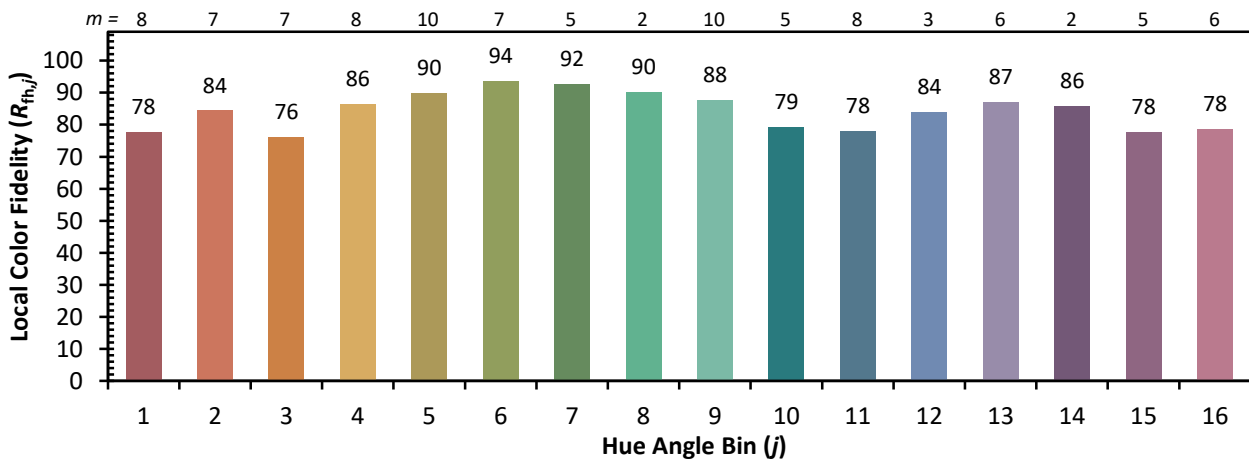
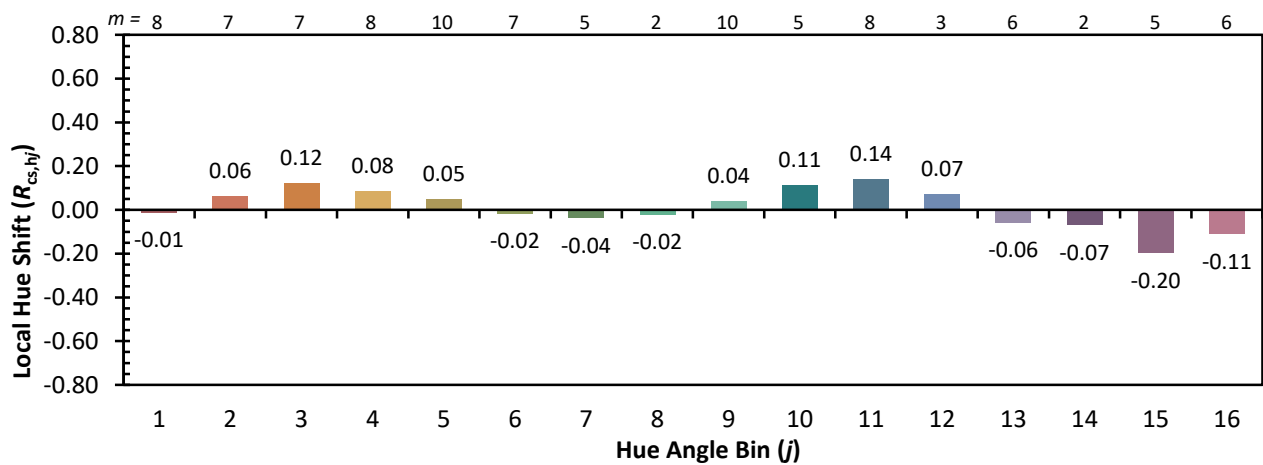
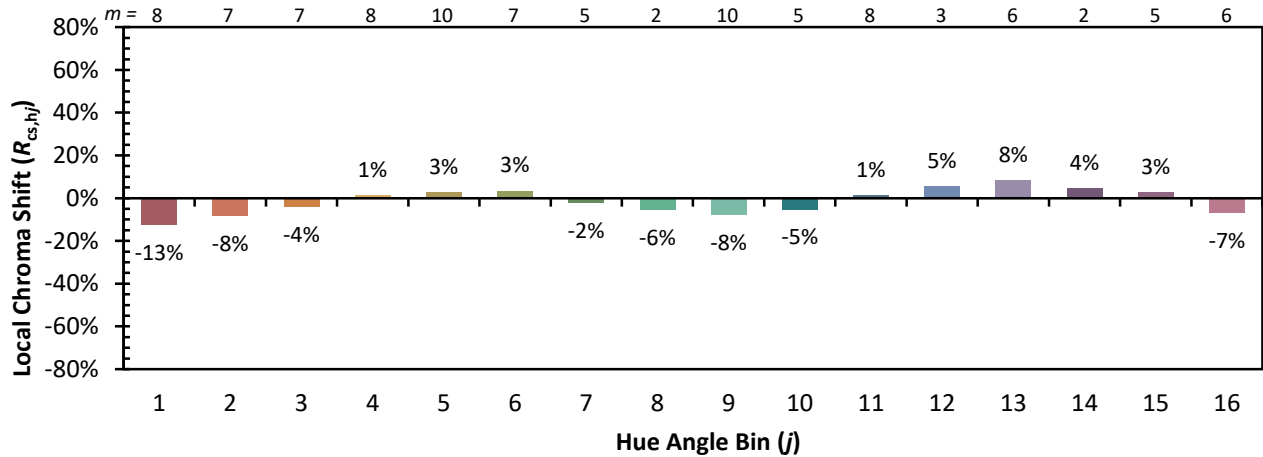
### Color Vector Graphics



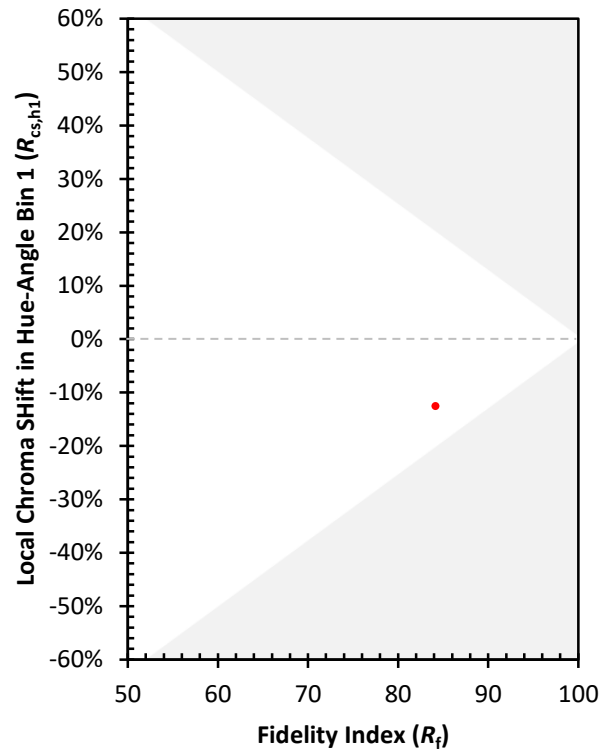
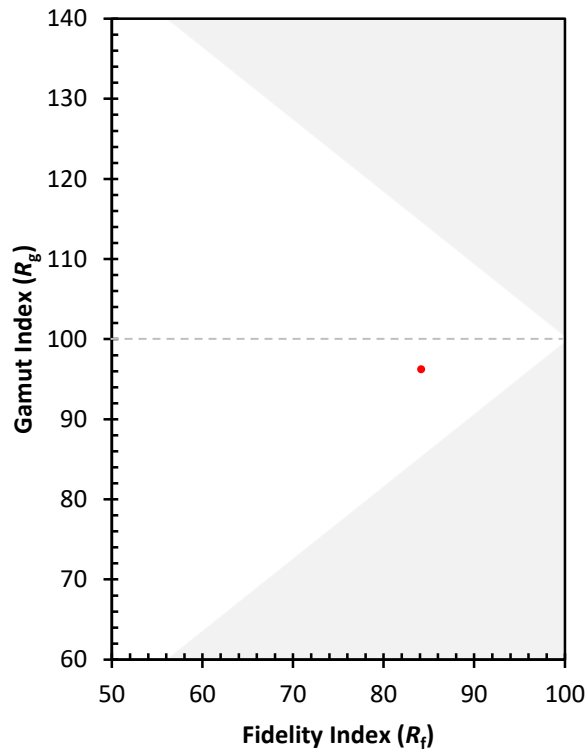
**Individual Sample Fidelity Index ( $R_{f,i}$ )**

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 80 | CES51 = 95 | CES76 = 74 |
| CES02 = 60 | CES27 = 94 | CES52 = 95 | CES77 = 82 |
| CES03 = 30 | CES28 = 91 | CES53 = 90 | CES78 = 72 |
| CES04 = 69 | CES29 = 84 | CES54 = 91 | CES79 = 91 |
| CES05 = 47 | CES30 = 94 | CES55 = 90 | CES80 = 88 |
| CES06 = 50 | CES31 = 85 | CES56 = 86 | CES81 = 83 |
| CES07 = 40 | CES32 = 79 | CES57 = 86 | CES82 = 95 |
| CES08 = 39 | CES33 = 90 | CES58 = 86 | CES83 = 95 |
| CES09 = 29 | CES34 = 85 | CES59 = 92 | CES84 = 90 |
| CES10 = 73 | CES35 = 92 | CES60 = 92 | CES85 = 81 |
| CES11 = 56 | CES36 = 87 | CES61 = 88 | CES86 = 77 |
| CES12 = 62 | CES37 = 91 | CES62 = 89 | CES87 = 84 |
| CES13 = 42 | CES38 = 97 | CES63 = 87 | CES88 = 87 |
| CES14 = 74 | CES39 = 97 | CES64 = 81 | CES89 = 79 |
| CES15 = 71 | CES40 = 94 | CES65 = 78 | CES90 = 88 |
| CES16 = 46 | CES41 = 98 | CES66 = 78 | CES91 = 75 |
| CES17 = 49 | CES42 = 91 | CES67 = 77 | CES92 = 66 |
| CES18 = 55 | CES43 = 88 | CES68 = 79 | CES93 = 80 |
| CES19 = 71 | CES44 = 99 | CES69 = 84 | CES94 = 64 |
| CES20 = 64 | CES45 = 93 | CES70 = 75 | CES95 = 73 |
| CES21 = 85 | CES46 = 91 | CES71 = 70 | CES96 = 83 |
| CES22 = 77 | CES47 = 95 | CES72 = 90 | CES97 = 91 |
| CES23 = 91 | CES48 = 86 | CES73 = 68 | CES98 = 85 |
| CES24 = 90 | CES49 = 90 | CES74 = 94 | CES99 = 75 |
| CES25 = 71 | CES50 = 95 | CES75 = 72 |            |



**Color Rendition by Hue-Angle Bin**


**Measure Comparisons**



(END OF REPORT)