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: McGRAW-EDISON

Report Number: P821436

Luminaire Tested: **TT-D1-830-12VDC-RW-UPL**

Issue Date: 10/29/2020

Report Generated By 670245763

Cooper Lighting Solutions Photometric Lab
1121 Highway 74 South
Peachtree City, GA 30269

Scaled Data Report

**Test Information**

| | |
|---|---|
| Test Method: | LM-79-08 |
| Report Number: | P821436 |
| | REPORT IS FROM IESNA LM-79-08 TEST DATA - UPLIGHT (G2-2002-677-2) AND |
| Test Lab: | INNOVATION CENTER |
| Issue Date: | 10/29/2020 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS (FORMERLY EATON) |
| Product Line: | McGRAW-EDISON |
| Catalog Number: | TT-D1-830-12VDC-RW-UPL |
| Description: | TOPTIER LED PARKING GARAGE LUMINAIRE WITH UPLIGHT |
| | 3000K, 80 CRI LEDS AND RECTANGULAR DISTRIBUTION |
| Light Source: | - |
| Ballast/Driver: | ELECTRONIC DRIVER |

**Summary**

| | |
|---|---|
| Lumens per Lamp: | N/A |
| Luminaire Lumens: | 3592.7 lumens |
| Efficiency: | N/A |
| Efficacy: | 128.3 lumens/watt |
| Luminous Opening: | Vertical Cylinder (Dia: 1.12' x H: 0.1') |
| IES Classification: | Type IV - Short |
| BUG Rating: | B2 - U4 - G2 |

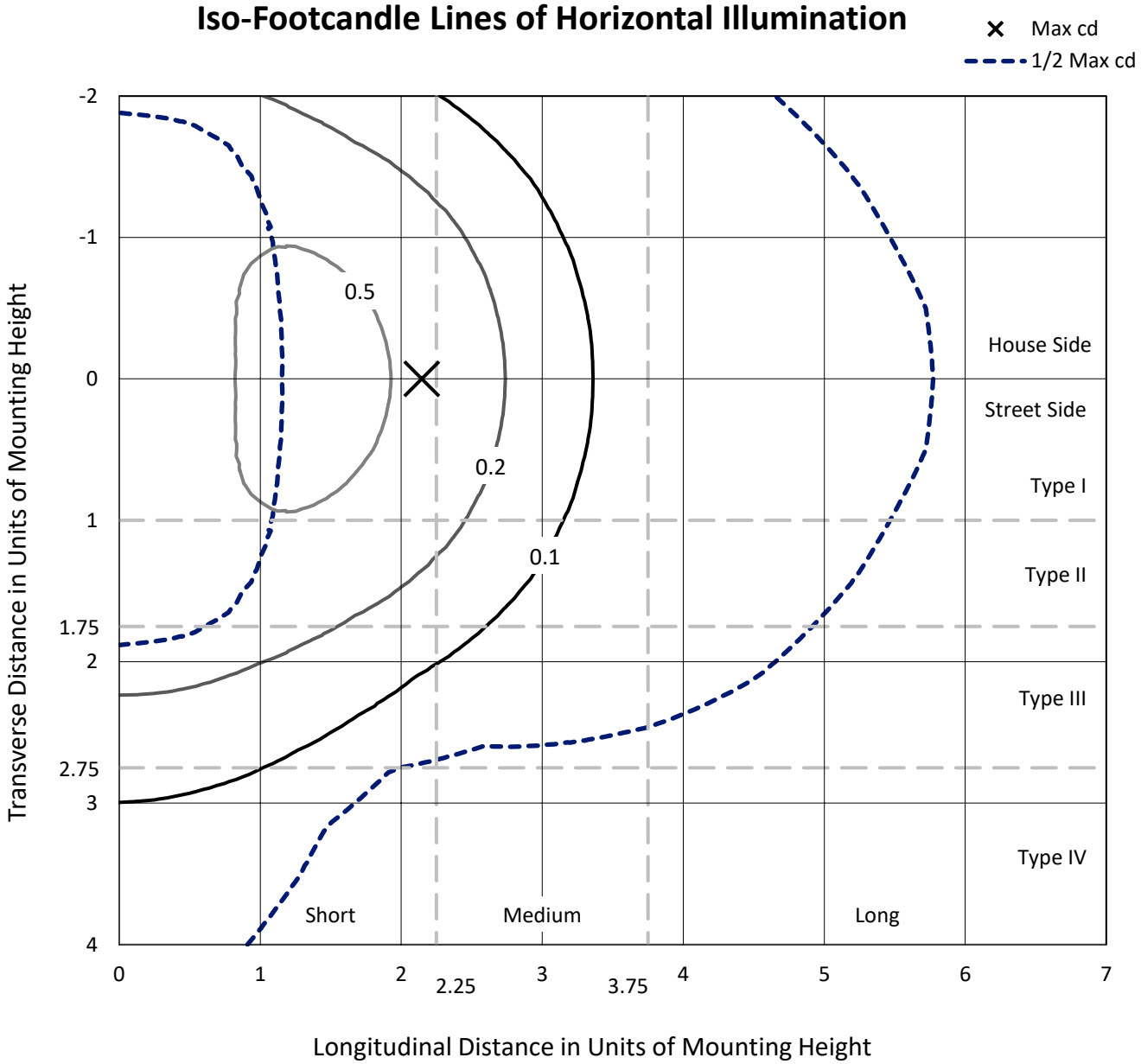
| | |
|---|---|
| Input Watts (W): | 28 |
| Input Voltage (V): | NR |
| Input Current (Ain): | NR |
| Voltage Rise (V): | NR |
| Power Factor: | NR |
| Total Harmonic Distortion (THDi): | NR |
| Frequency (hertz): | 60 |
| Stabilization Time: | NR |
| Operation Time: | NR |
| Ambient Temperature (°C): | NR |
| Test Distance: | 25 FT |

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Scaled Data Report

REPORT NUMBER: P821436
CATALOG NUMBER: TT-D1-830-12VDC-RW-UPL

## Iso-Footcandle Lines of Horizontal Illumination



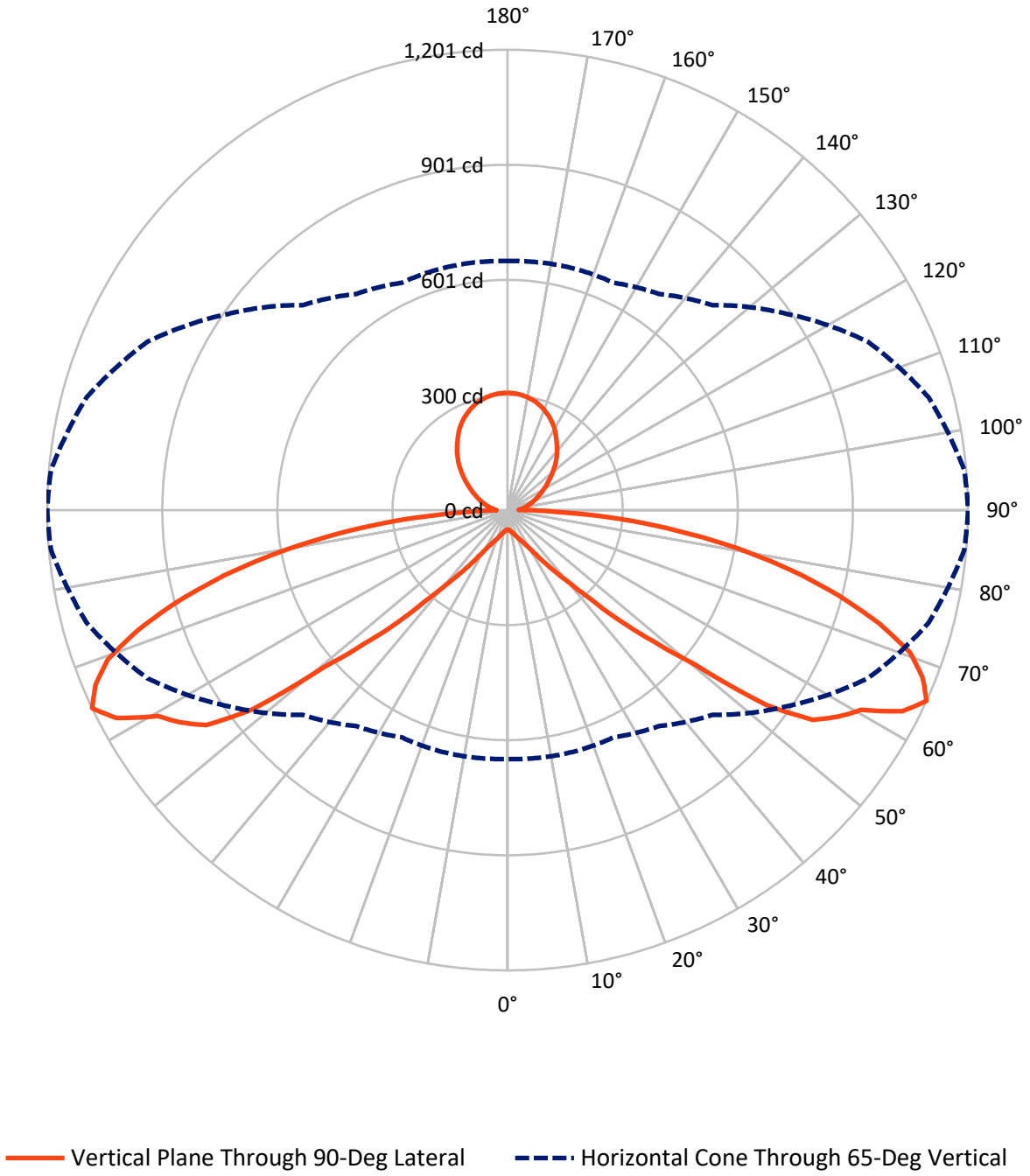

Based on 15 foot mounting height. Maximum calculated value = 0.8 fc
Type IV - Short - N/A

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Peachtree City, GA 30269

Scaled Data Report

REPORT NUMBER: P821436
CATALOG NUMBER: TT-D1-830-12VDC-RW-UPL

## Luminous Intensity Polar Plot



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Scaled Data Report

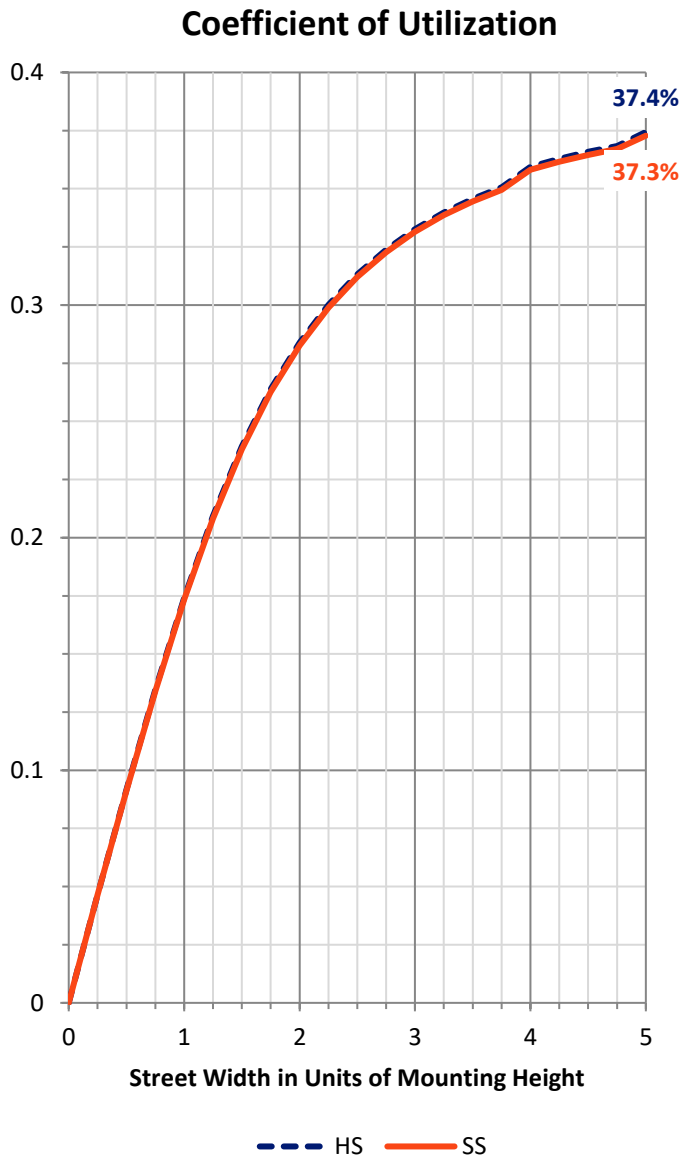
REPORT NUMBER: P821436
CATALOG NUMBER: TT-D1-830-12VDC-RW-UPL

**FLUX DISTRIBUTION:**

| | | Downward | Upward | Total |
|---|---|---|---|---|
| **House Side** | Lumens | 1380.5 | 415.9 | 1796.4 |
| | % Fixture | 38.4 | 11.6 | 50.0 |
| **Street Side** | Lumens | 1380.5 | 415.9 | 1796.4 |
| | % Fixture | 38.4 | 11.6 | 50.0 |
| **Total** | Lumens | 2761.0 | 831.7 | 3592.7 |
| | % Fixture | 76.8 | 23.2 | 100.0 |

**ZONAL LUMENS:**

| Zone | Lumens | % Fixture |
|---|---|---|
| 0°-10° | 5.3 | 0.1 |
| 10°-20° | 19.7 | 0.5 |
| 20°-30° | 45.4 | 1.3 |
| 30°-40° | 102.7 | 2.9 |
| 40°-50° | 250.2 | 7.0 |
| 50°-60° | 562.7 | 15.7 |
| 60°-70° | 822.3 | 22.9 |
| 70°-80° | 716.6 | 19.9 |
| 80°-90° | 236.1 | 6.6 |
| 90°-100° | 42.6 | 1.2 |
| 100°-110° | 66.0 | 1.8 |
| 110°-120° | 91.9 | 2.6 |
| 120°-130° | 119.0 | 3.3 |
| 130°-140° | 138.7 | 3.9 |
| 140°-150° | 140.5 | 3.9 |
| 150°-160° | 121.9 | 3.4 |
| 160°-170° | 82.2 | 2.3 |
| 170°-180° | 28.9 | 0.8 |
| 0°-90° | 2761.0 | 76.8 |
| 0°-180° | 3592.7 | 100.0 |



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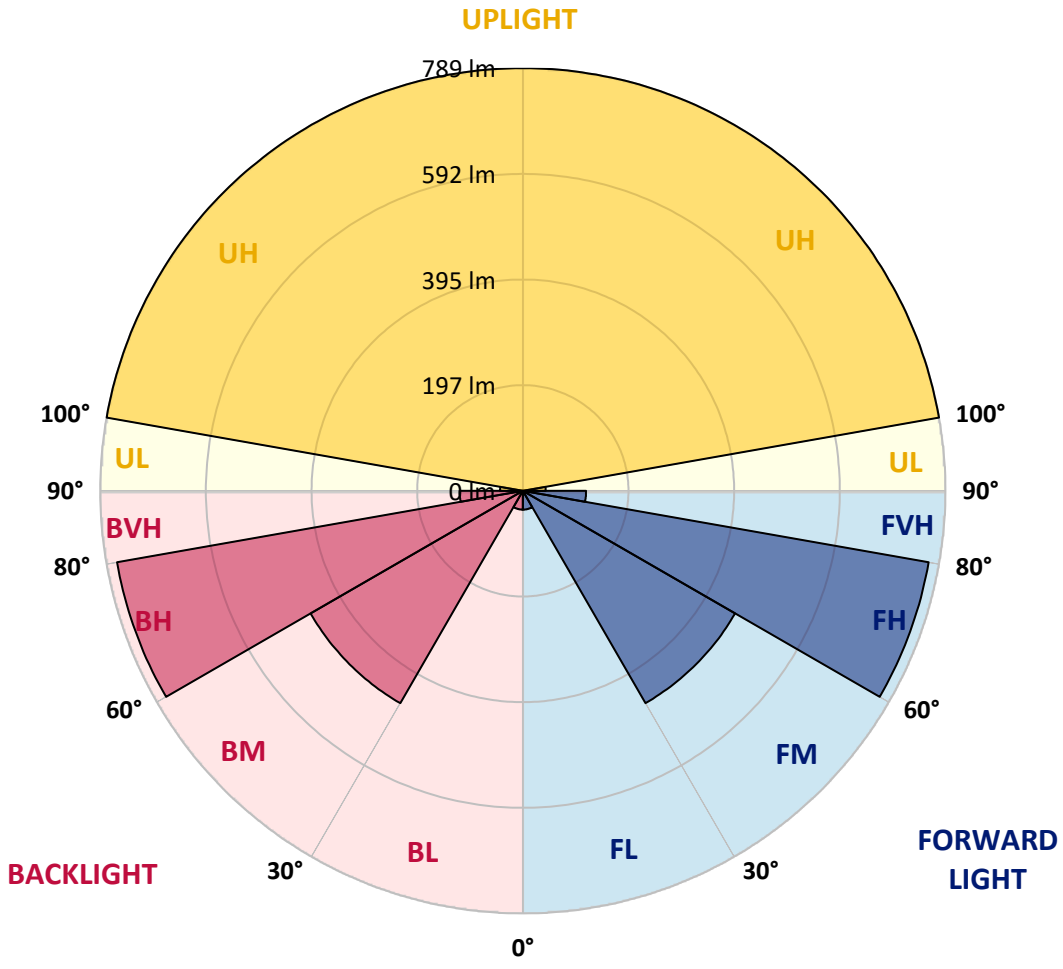
Scaled Data Report

REPORT NUMBER: P821436
CATALOG NUMBER: TT-D1-830-12VDC-RW-UPL

## LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:

| Zone | | Lumens | % Fixture | Zone Rating/Lumen Limit B | U | G |
|---|---|---|---|---|---|---|
| FL | (0°-30°) | 35.2 | 1.0 | | | |
| FM | (30°-60°) | 457.8 | 12.7 | | | |
| FH | (60°-80°) | 769.5 | 21.4 | | | G1/1800 |
| FVH | (80°-90°) | 118.0 | 3.3 | | | G2/225 |
| BL | (0°-30°) | 35.2 | 1.0 | B0/110 | | |
| BM | (30°-60°) | 457.8 | 12.7 | B1/1000 | | |
| BH | (60°-80°) | 769.5 | 21.4 | B2/1000 | | G2/1000 |
| BVH | (80°-90°) | 118.0 | 3.3 | | | G2/225 |
| UL | (90°-100°) | 42.6 | 1.2 | | U2/50 | |
| UH | (100°-180°) | 789.1 | 22.0 | | U4/1000 | |

**BUG Rating: B2-U4-G2**
Type IV Short



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Scaled Data Report

REPORT NUMBER: P821436
CATALOG NUMBER: TT-D1-830-12VDC-RW-UPL

**CANDELA DISTRIBUTION (FULL):**

| | 0° | 5° | 15° | 25° | 35° | 45° | 55° | 65° | 75° | 85° | 90° |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0° | 50.4 | 50.4 | 50.4 | 50.4 | 50.4 | 50.4 | 50.4 | 50.4 | 50.4 | 50.4 | *50.4* |
| 2.5° | 51.0 | 51.0 | 51.7 | 51.7 | 51.7 | 51.7 | 51.7 | 51.7 | 51.7 | 51.7 | *51.7* |
| 5° | 53.0 | 53.0 | 53.0 | 53.0 | 53.6 | 53.6 | 53.0 | 53.0 | 53.0 | 53.0 | *53.0* |
| 7.5° | 56.3 | 55.6 | 56.3 | 56.3 | 56.3 | 55.6 | 55.6 | 55.6 | 54.9 | 54.9 | *54.9* |
| 10° | 59.5 | 59.5 | 60.2 | 59.5 | 59.5 | 58.9 | 58.9 | 58.9 | 58.2 | 58.2 | *58.2* |
| 12.5° | 64.1 | 64.1 | 64.1 | 64.1 | 63.5 | 63.5 | 62.8 | 62.1 | 61.5 | 61.5 | *61.5* |
| 15° | 70.0 | 69.3 | 69.3 | 68.7 | 68.0 | 67.4 | 66.7 | 66.7 | 66.1 | 66.1 | *66.1* |
| 17.5° | 75.9 | 75.9 | 75.2 | 74.6 | 73.3 | 72.6 | 72.6 | 72.0 | 71.3 | 71.3 | *71.3* |
| 20° | 83.1 | 83.1 | 82.4 | 81.1 | 79.8 | 79.2 | 78.5 | 78.5 | 77.8 | 77.8 | *77.8* |
| 22.5° | 91.6 | 90.9 | 89.6 | 88.3 | 87.0 | 86.3 | 85.7 | 85.0 | 85.0 | 85.0 | *85.0* |
| 25° | 100.7 | 100.1 | 99.4 | 97.5 | 95.5 | 94.9 | 93.5 | 93.5 | 92.9 | 93.5 | *93.5* |
| 27.5° | 111.9 | 111.2 | 109.9 | 107.9 | 105.3 | 104.0 | 103.4 | 103.4 | 104.0 | 104.0 | *104.7* |
| 30° | 125.6 | 124.3 | 123.0 | 120.4 | 117.7 | 115.8 | 115.8 | 116.4 | 118.4 | 119.7 | *119.7* |
| 32.5° | 142.0 | 141.3 | 139.3 | 136.7 | 132.1 | 130.8 | 132.1 | 136.1 | 138.7 | 140.6 | *142.0* |
| 35° | 160.9 | 160.3 | 157.7 | 153.1 | 149.8 | 149.1 | 153.1 | 159.6 | 168.1 | 170.7 | *172.0* |
| 37.5° | 181.9 | 182.5 | 179.2 | 174.0 | 170.7 | 172.0 | 179.9 | 192.3 | 200.8 | 206.7 | *208.0* |
| 40° | 208.0 | 209.3 | 205.4 | 199.5 | 196.2 | 201.5 | 213.9 | 228.3 | 243.3 | 250.5 | *252.5* |
| 42.5° | 238.8 | 240.7 | 235.5 | 229.6 | 227.6 | 236.2 | 253.8 | 277.4 | 304.2 | 312.7 | *316.0* |
| 45° | 276.7 | 278.0 | 271.5 | 266.2 | 264.9 | 280.0 | 310.1 | 349.3 | 391.8 | 411.5 | *414.7* |
| 47.5° | 321.8 | 321.2 | 315.3 | 308.8 | 310.1 | 331.7 | 376.8 | 429.8 | 474.9 | 505.0 | *511.6* |
| 50° | 373.5 | 370.3 | 365.7 | 357.8 | 366.3 | 397.7 | 454.6 | 518.8 | 594.6 | 621.5 | *633.2* |
| 52.5° | 425.2 | 419.3 | 415.4 | 410.2 | 425.2 | 465.8 | 545.6 | 657.4 | 771.9 | 833.4 | *845.8* |
| 55° | 471.7 | 467.1 | 465.1 | 465.8 | 489.3 | 547.5 | 652.2 | 795.5 | 906.0 | 957.0 | *966.2* |
| 57.5° | 517.4 | 514.8 | 512.9 | 516.8 | 554.1 | 630.0 | 747.7 | 881.8 | 972.7 | 1010.7 | *1017.2* |
| 60° | 560.6 | 563.2 | 561.9 | 573.7 | 618.8 | 695.4 | 797.4 | 929.6 | 1017.2 | 1051.9 | *1059.1* |
| 62.5° | 608.4 | 610.3 | 610.3 | 623.4 | 660.1 | 727.4 | 831.4 | 985.8 | 1097.0 | 1148.1 | *1155.9* |
| 65° | *649.6* | *650.9* | *653.5* | *654.2* | *688.2* | *755.6* | *891.6* | *1037.5* | *1136.9* | *1195.8* | *1201.0* |
| 67.5° | 680.3 | 681.6 | 678.4 | 675.1 | 701.3 | 762.1 | 887.0 | 1031.0 | 1119.3 | 1163.8 | *1167.7* |
| 70° | 705.2 | 699.3 | 690.1 | 673.8 | 682.3 | 728.1 | 849.1 | 978.6 | 1067.6 | 1107.5 | *1113.4* |
| 72.5° | 708.5 | 703.2 | 674.4 | 637.8 | 627.3 | 667.2 | 782.4 | 898.8 | 975.4 | 1013.3 | *1014.0* |
| 75° | 688.8 | 675.1 | 627.3 | 572.4 | 552.8 | 590.7 | 689.5 | 795.5 | 857.0 | 889.0 | *892.3* |
| 77.5° | 622.8 | 609.7 | 549.5 | 486.7 | 464.5 | 497.2 | 580.9 | 666.6 | 725.5 | 756.9 | *758.8* |
| 80° | 505.7 | 501.1 | 446.1 | 388.6 | 361.8 | 380.7 | 454.0 | 521.4 | 569.1 | 606.4 | *609.7* |
| 82.5° | 372.9 | 368.9 | 327.1 | 276.7 | 255.1 | 270.8 | 323.2 | 372.9 | 417.4 | 447.4 | *449.4* |
| 85° | 232.9 | 225.0 | 198.9 | 163.5 | 149.1 | 159.6 | 194.3 | 227.6 | 267.6 | 291.1 | *292.4* |
| 87.5° | 77.8 | 74.6 | 64.1 | 53.0 | 44.5 | 46.4 | 56.9 | 69.3 | 101.4 | 111.9 | *118.4* |
| 90° | 30.1 | 29.1 | 29.1 | 29.1 | 29.1 | 29.1 | 29.1 | 29.1 | 29.1 | 29.1 | *29.1* |
| 92.5° | 34.8 | 34.2 | 34.2 | 33.8 | 33.8 | 33.8 | 33.8 | 33.8 | 33.8 | 33.8 | *33.8* |
| 95° | 39.4 | 39.4 | 39.4 | 38.5 | 38.5 | 38.5 | 38.5 | 38.5 | 38.5 | 38.5 | *38.5* |
| 97.5° | 44.6 | 44.6 | 44.6 | 44.2 | 44.2 | 44.2 | 44.2 | 44.2 | 44.2 | 44.2 | *44.2* |
| 100° | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 | 49.8 | *49.8* |
| 102.5° | 55.9 | 55.9 | 55.9 | 55.9 | 55.9 | 55.9 | 55.9 | 56.4 | 55.9 | 55.9 | *55.9* |
| 105° | 62.0 | 62.0 | 62.0 | 62.0 | 62.0 | 62.0 | 62.0 | 62.9 | 62.0 | 62.0 | *62.0* |
| 107.5° | 68.6 | 68.6 | 69.0 | 69.0 | 69.0 | 69.0 | 69.0 | 69.5 | 69.0 | 69.0 | *69.0* |
| 110° | 75.1 | 75.1 | 76.1 | 76.1 | 76.1 | 76.1 | 76.1 | 76.1 | 76.1 | 76.1 | *76.1* |

Cooper Lighting Solutions Photometric Lab
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Peachtree City, GA 30269

Scaled Data Report

REPORT NUMBER: P821436
CATALOG NUMBER: TT-D1-830-12VDC-RW-UPL

**CANDELA DISTRIBUTION (continued):**

| | 0° | 5° | 15° | 25° | 35° | 45° | 55° | 65° | 75° | 85° | 90° |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 112.5° | 83.1 | 83.1 | 84.0 | 84.0 | 84.0 | 84.0 | 84.6 | 84.6 | 84.0 | 84.0 | *84.0* |
| 115° | 91.1 | 91.1 | 92.0 | 92.0 | 92.0 | 92.0 | 93.0 | 93.0 | 92.0 | 92.0 | *92.0* |
| 117.5° | 100.5 | 100.5 | 101.0 | 101.4 | 101.4 | 101.4 | 102.4 | 102.4 | 101.4 | 101.4 | *101.4* |
| 120° | 109.9 | 109.9 | 109.9 | 110.8 | 110.8 | 110.8 | 111.8 | 111.8 | 110.8 | 110.8 | *110.8* |
| 122.5° | 120.7 | 120.7 | 121.2 | 121.6 | 121.6 | 121.6 | 122.6 | 122.6 | 122.1 | 122.1 | *121.6* |
| 125° | 131.5 | 131.5 | 132.4 | 132.4 | 132.4 | 132.4 | 133.4 | 133.4 | 133.4 | 133.4 | *132.4* |
| 127.5° | 143.2 | 143.2 | 144.2 | 144.2 | 144.2 | 144.2 | 145.1 | 145.1 | 145.1 | 145.1 | *144.2* |
| 130° | 155.0 | 155.0 | 155.9 | 155.9 | 155.9 | 155.9 | 156.8 | 156.8 | 156.8 | 156.8 | *155.9* |
| 132.5° | 167.2 | 167.2 | 167.6 | 167.6 | 167.6 | 168.1 | 168.6 | 168.6 | 168.6 | 168.6 | *168.1* |
| 135° | 179.4 | 179.4 | 179.4 | 179.4 | 179.4 | 180.3 | 180.3 | 180.3 | 180.3 | 180.3 | *180.3* |
| 137.5° | 191.2 | 190.6 | 191.2 | 190.6 | 191.2 | 191.6 | 191.6 | 191.6 | 191.6 | 191.6 | *191.6* |
| 140° | 202.9 | 201.9 | 202.9 | 201.9 | 202.9 | 202.9 | 202.9 | 202.9 | 202.9 | 202.9 | *202.9* |
| 142.5° | 213.7 | 213.2 | 213.7 | 212.7 | 213.7 | 213.7 | 213.7 | 213.7 | 213.7 | 213.7 | *213.7* |
| 145° | 224.5 | 224.5 | 224.5 | 223.5 | 224.5 | 224.5 | 224.5 | 224.5 | 224.5 | 224.5 | *224.5* |
| 147.5° | 235.8 | 235.3 | 235.8 | 234.8 | 235.8 | 235.8 | 235.8 | 235.8 | 235.8 | 235.8 | *235.8* |
| 150° | 247.0 | 246.1 | 247.0 | 246.1 | 247.0 | 247.0 | 247.0 | 247.0 | 247.0 | 247.0 | *247.0* |
| 152.5° | 256.0 | 255.5 | 256.4 | 255.5 | 256.0 | 256.0 | 256.4 | 256.0 | 256.0 | 256.0 | *256.0* |
| 155° | 264.9 | 264.9 | 265.8 | 264.9 | 264.9 | 264.9 | 265.8 | 264.9 | 264.9 | 264.9 | *264.9* |
| 157.5° | 272.4 | 272.4 | 273.3 | 272.4 | 272.4 | 272.4 | 273.3 | 272.4 | 272.4 | 272.4 | *272.4* |
| 160° | 279.9 | 279.9 | 280.8 | 279.9 | 279.9 | 279.9 | 280.8 | 279.9 | 279.9 | 279.9 | *279.9* |
| 162.5° | 286.0 | 286.0 | 286.9 | 286.0 | 286.0 | 286.0 | 286.9 | 286.0 | 286.0 | 286.0 | *286.0* |
| 165° | 292.1 | 292.1 | 293.0 | 292.1 | 292.1 | 292.1 | 293.0 | 292.1 | 292.1 | 292.1 | *292.1* |
| 167.5° | 295.8 | 295.8 | 296.8 | 295.8 | 295.8 | 295.8 | 296.8 | 295.8 | 295.8 | 295.8 | *295.8* |
| 170° | 299.6 | 299.6 | 300.5 | 299.6 | 299.6 | 299.6 | 300.5 | 299.6 | 299.6 | 299.6 | *299.6* |
| 172.5° | 302.0 | 302.0 | 302.8 | 302.0 | 302.4 | 302.0 | 302.8 | 302.0 | 302.0 | 302.0 | *302.0* |
| 175° | 304.3 | 304.3 | 305.2 | 304.3 | 305.2 | 304.3 | 305.2 | 304.3 | 304.3 | 304.3 | *304.3* |
| 177.5° | 305.2 | 305.2 | 305.7 | 305.2 | 305.7 | 305.2 | 305.7 | 305.2 | 305.2 | 305.2 | *305.2* |
| 180° | 306.2 | 306.2 | 306.2 | 306.2 | 306.2 | 306.2 | 306.2 | 306.2 | 306.2 | 306.2 | *306.2* |

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

Report Generated By FNC07603 / LDUCLS01DT446
Version: v7.04

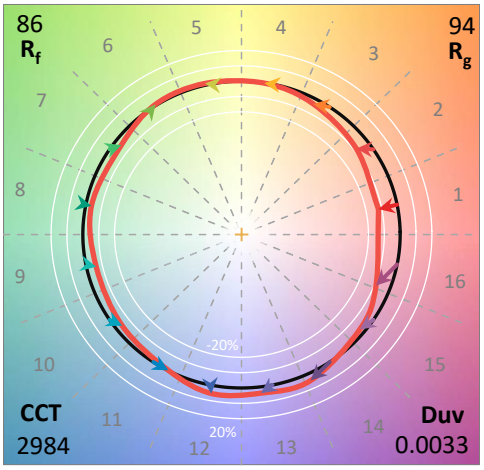
## Test Information

| | |
|---|---|
| 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 | CRI (Ra): | 81.8 | | |
| CIE u': | 0.2500 | R1: | 79.4 | R9: | -1.1 |
| CIE v': | 0.5264 | R2: | 89.9 | R10: | 78.4 |
| Duv: | 0.0033 | R3: | 96.6 | R11: | 80.8 |
| CIE x: | 0.4431 | R4: | 80.6 | R12: | 72.8 |
| CIE y: | 0.4147 | R5: | 80.1 | R13: | 81.7 |
| CIE z: | 0.1422 | R6: | 88.9 | R14: | 98.5 |
| Peak Wavelength (nm): | 601 | R7: | 82.6 | R15: | 70.2 |
| Dominant Wavelength (nm): | 581 | R8: | 56.0 | | |
| Purity: | 57.4798 | | | | |

| | |
|---|---|
| Rf: | 85.8 |
| Rg: | 94.1 |




## Test Conditions

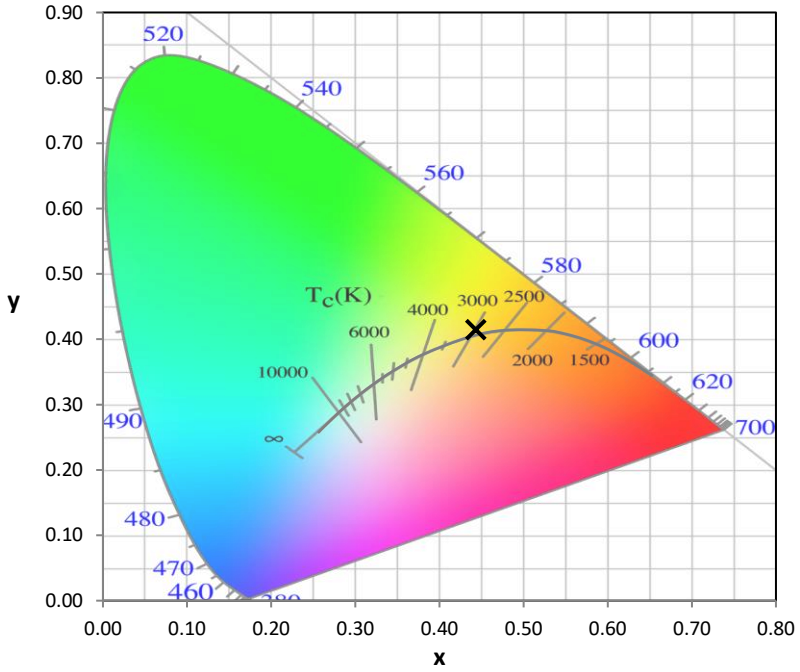
| | |
|---|---|
| Stabilization Time: | 29M |
| Operation Time: | 1H 29M |
| Sphere Temperature (°C): | 25.2 |

REPORT NUMBER: SP1-2407-176-7

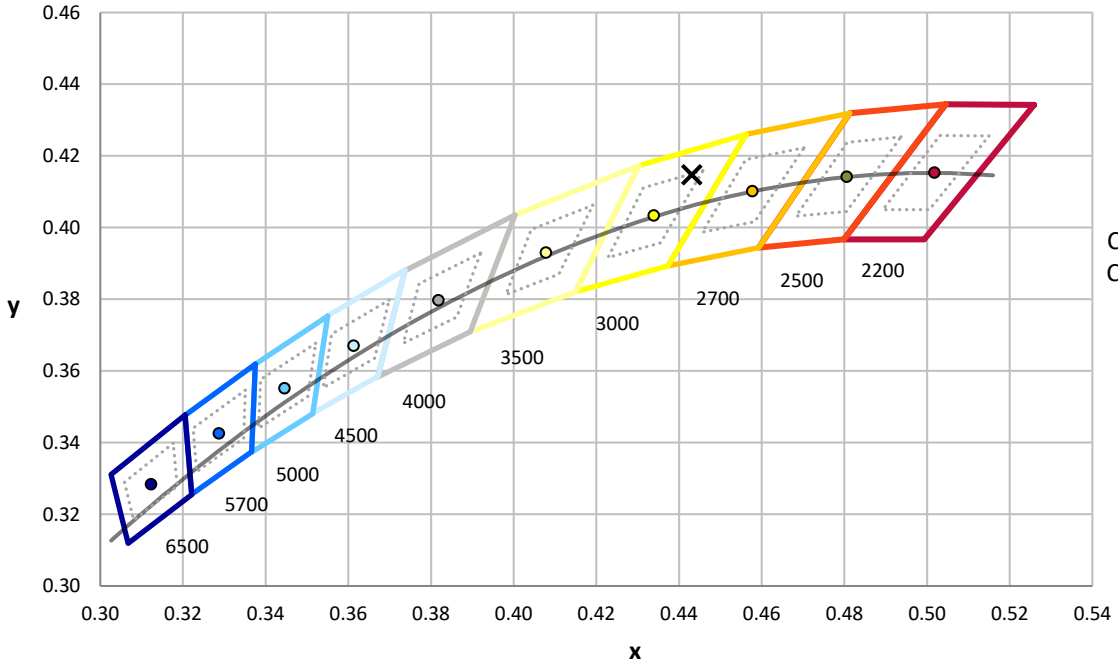
| Measurement and Test Equipment | | | |
|---|---|---|---|
| Instrument | Identification Number | Calibration Date | Calibration Due Date |
| Photometer | IN0058 | 6/18/2024 | 12/18/2024 |
| Power Meter | INXT2011004 | 2/8/2024 | 2/8/2025 |
| AC Power Source | IN0063 | 10/24/2023 | 10/24/2024 |
| DC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

REPORT NUMBER: SP1-2407-176-7

## CIE 1931 Chromaticity Diagram




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

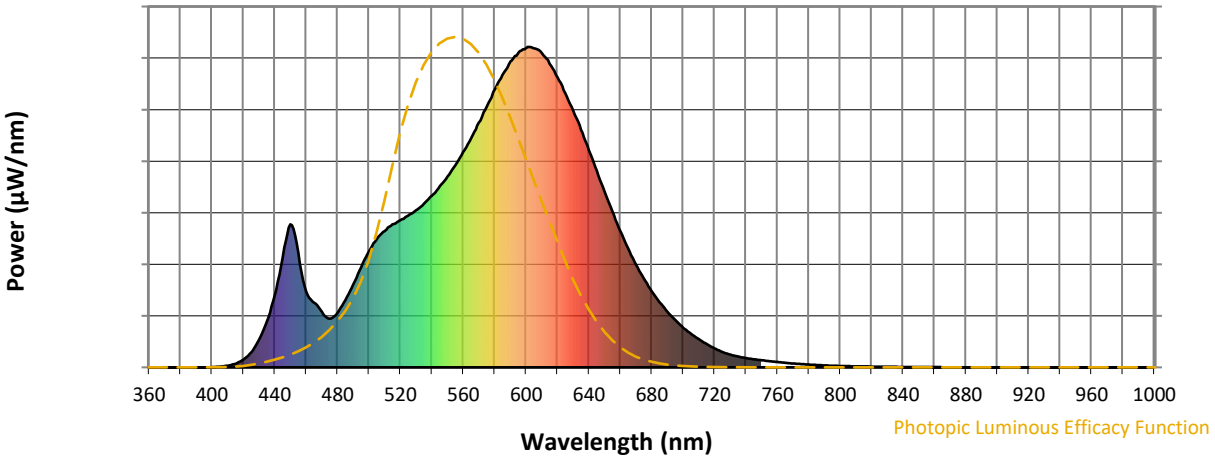



CCT = 2984K
CIE x = 0.4431
CIE y = 0.4147
Duv = 0.0033

Point lies inside the ANSI 3000K 4-step quadrangle

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## Photopic Flux vs. Wavelength

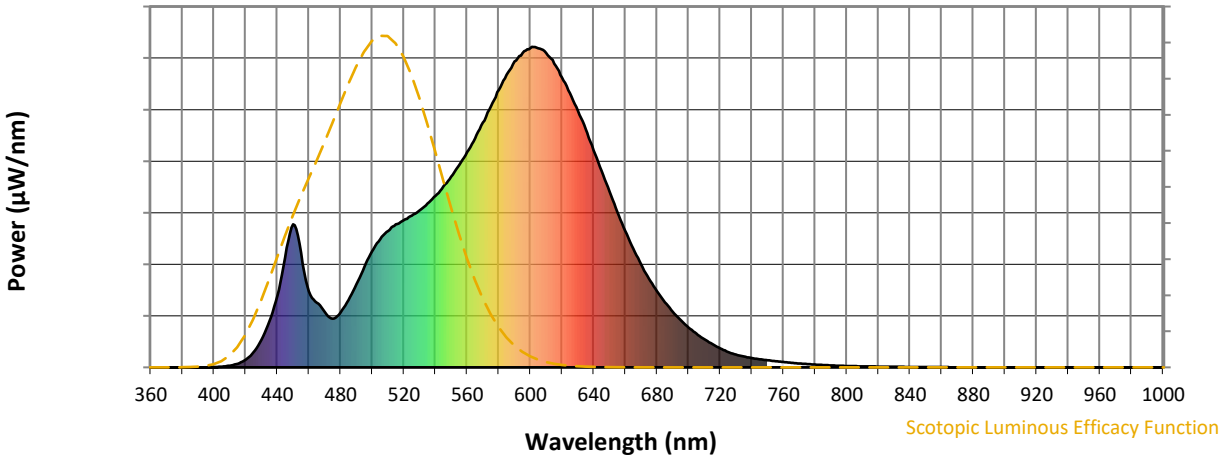



## Photopic Lumens: NR

| λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | NR | 490 | 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

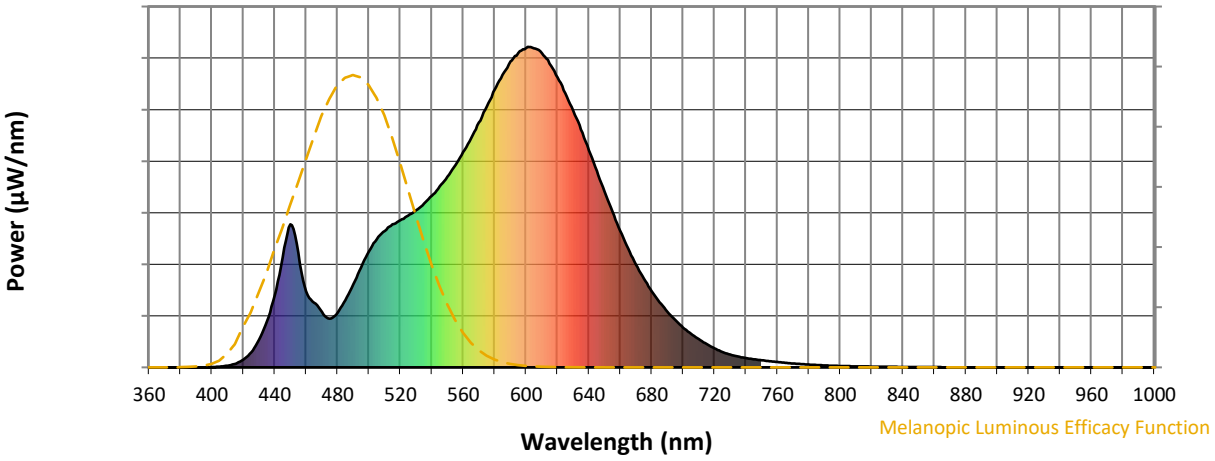



**Scotopic Lumens: NR** **S/P: 1.32**

| λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | NR | 490 | 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^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | NR | 490 | 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 | | | |

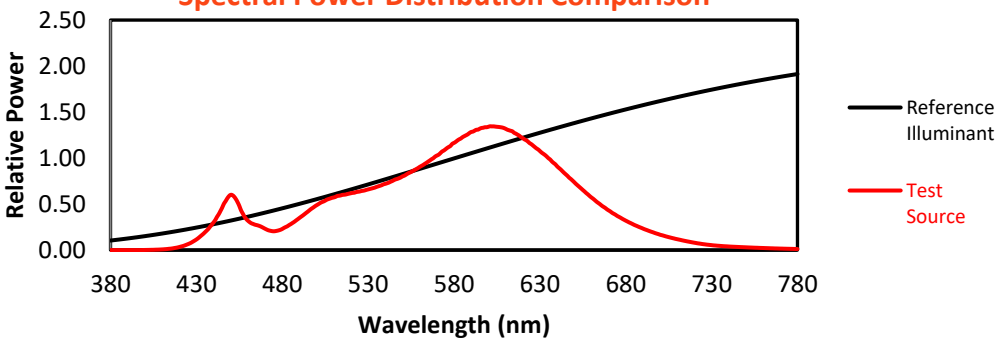
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# TM-30-18

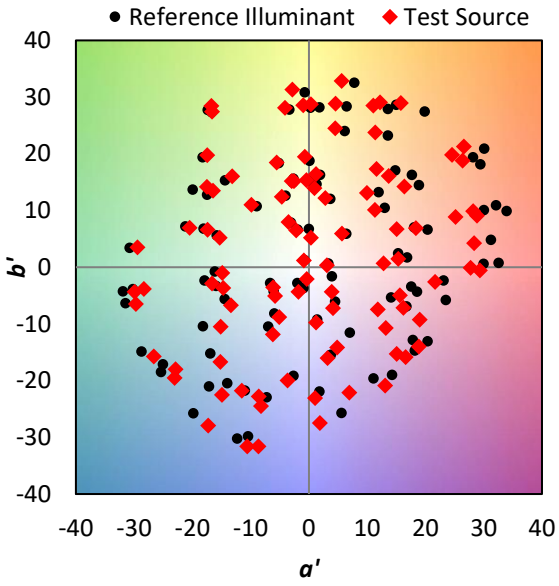
## Summary

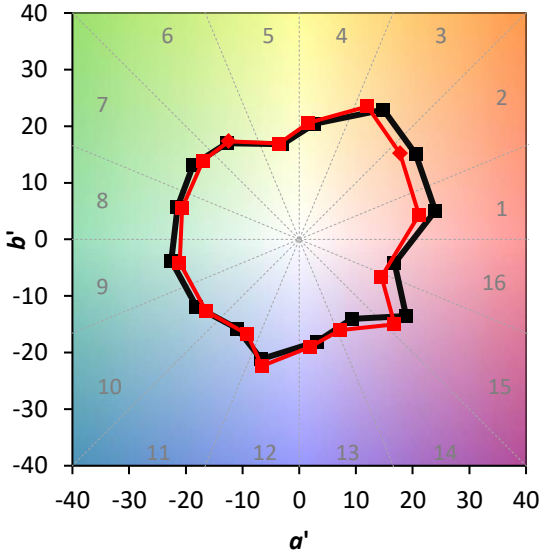
$R_f$ = 85.8
$R_g$ = 94.1
CIE $R_a$ = 81.8
$R_9$ = -1.1

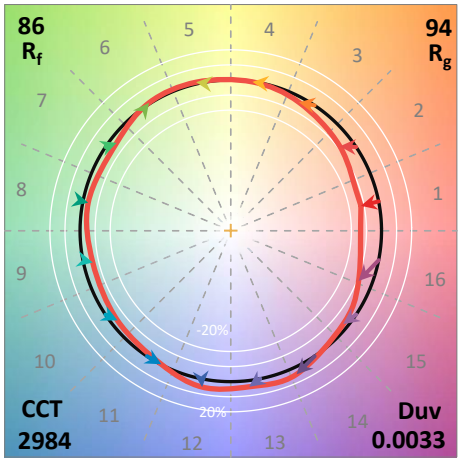
## Spectral Power Distribution Comparison

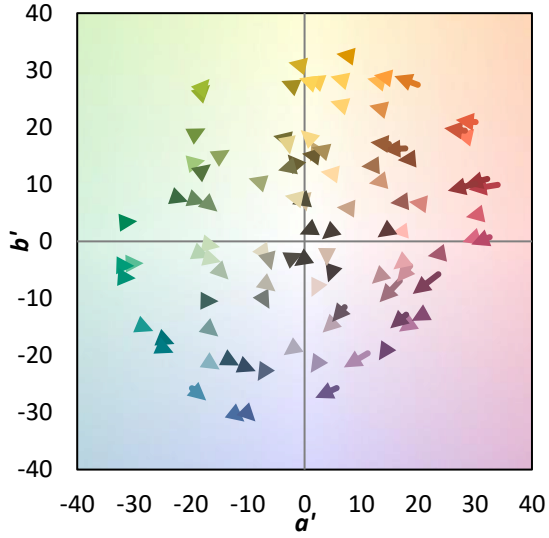



## Color Vector Graphics



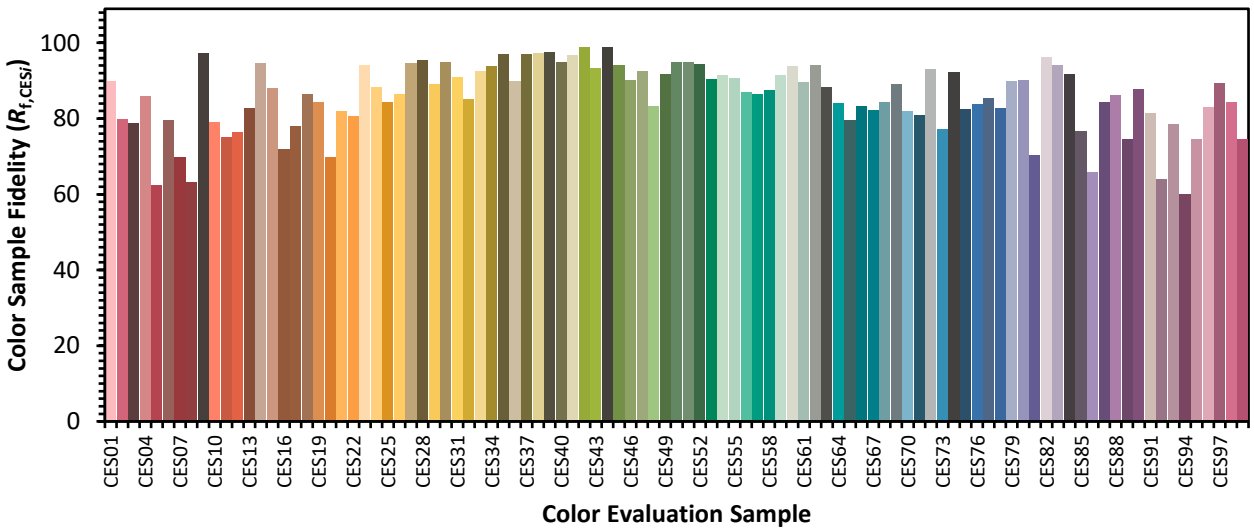



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**Individual Sample Fidelity Index ($R_{f,i}$)**

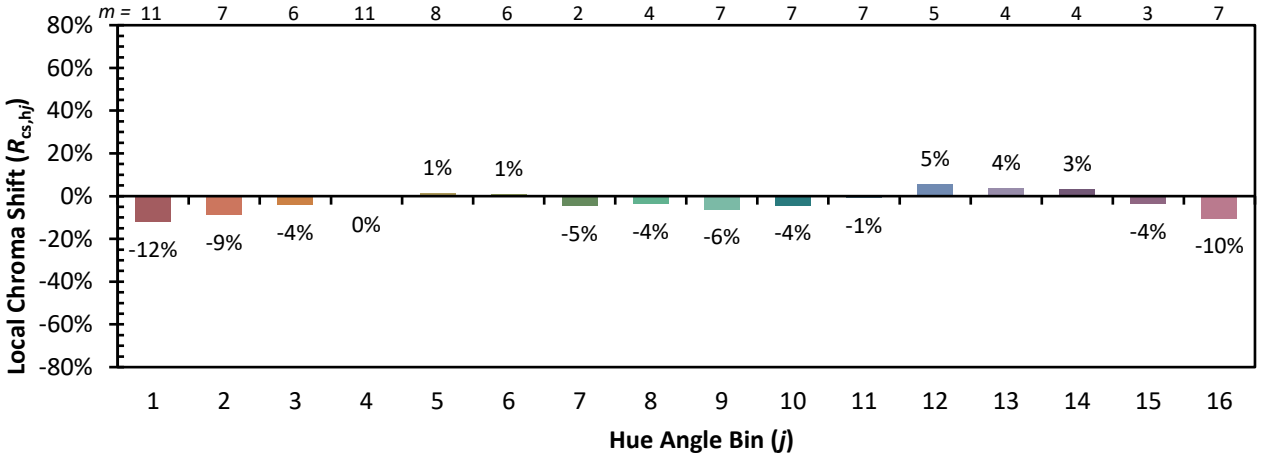
| | | | |
|---|---|---|---|
| CES01 = 86 | CES26 = 86 | CES51 = 95 | CES76 = 84 |
| CES02 = 63 | CES27 = 95 | CES52 = 94 | CES77 = 86 |
| CES03 = 31 | CES28 = 95 | CES53 = 90 | CES78 = 83 |
| CES04 = 70 | CES29 = 89 | CES54 = 91 | CES79 = 90 |
| CES05 = 50 | CES30 = 95 | CES55 = 91 | CES80 = 90 |
| CES06 = 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 | |

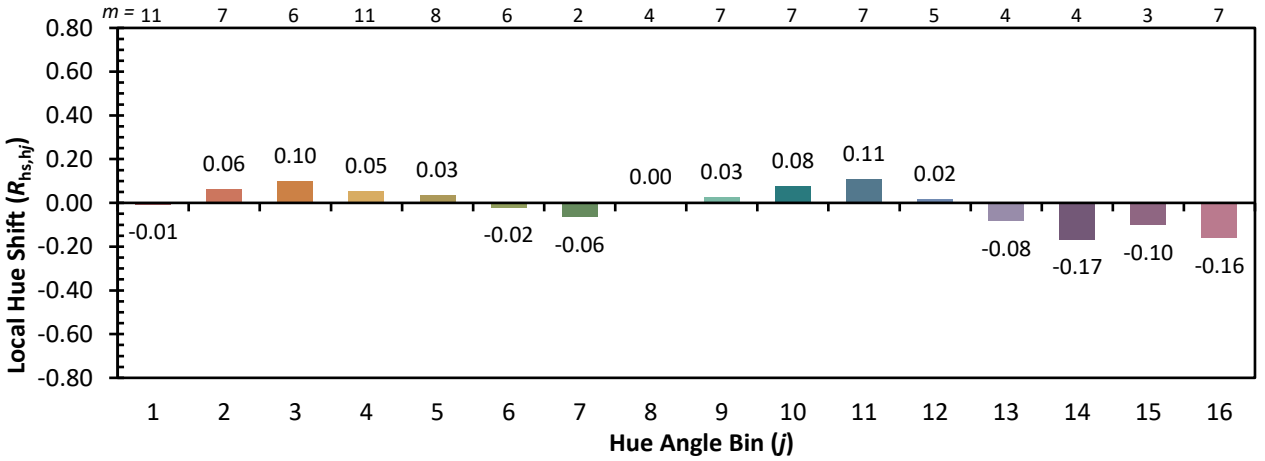


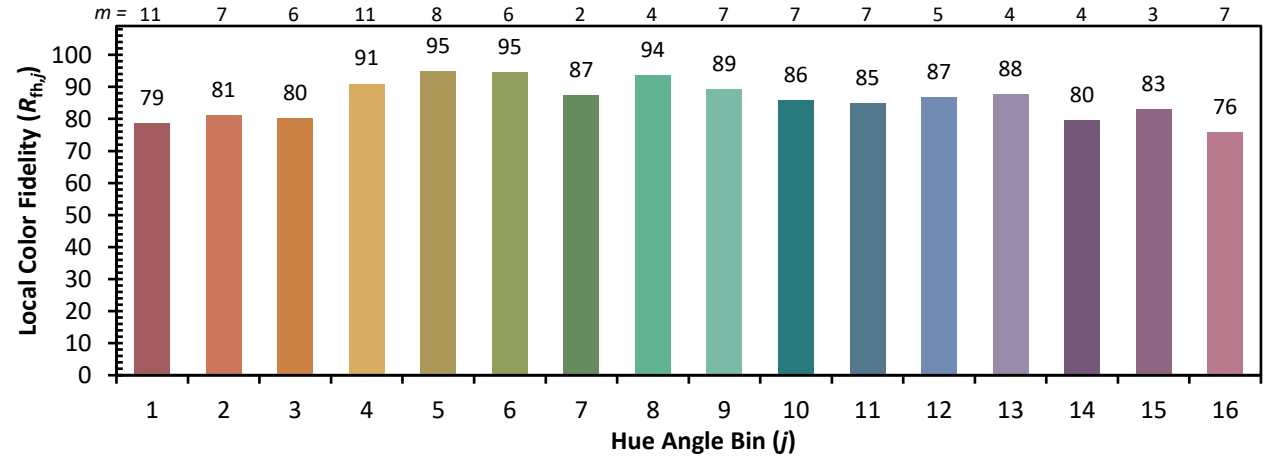
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## Color Rendition by Hue-Angle Bin



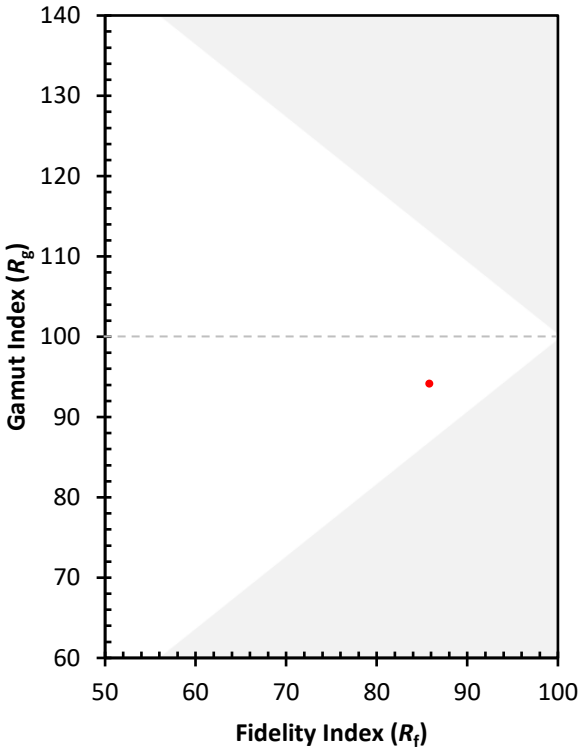



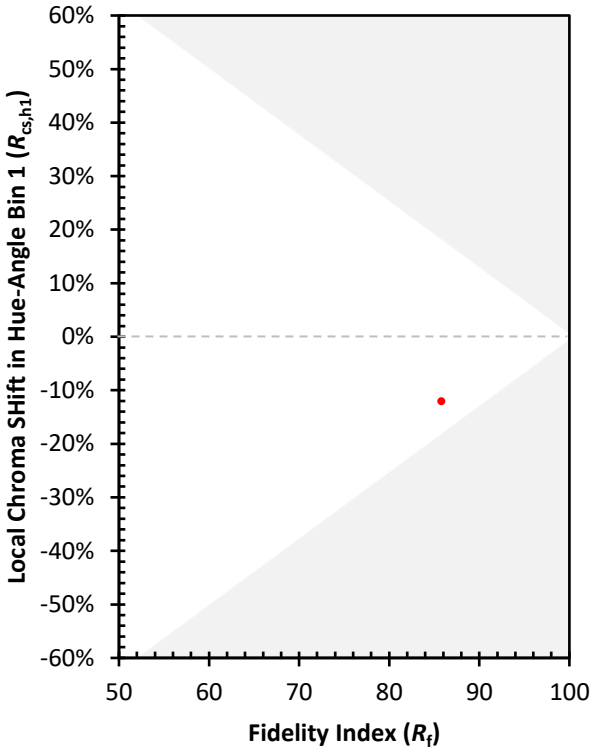



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## Measure Comparisons




(END OF REPORT)