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: P821317

Luminaire Tested: **TT-D4-740-24VDC-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: | P821317 |
| | REPORT IS FROM IESNA LM-79-08 TEST DATA - UPLIGHT (G2-2002-677-1) AND |
| Test Lab: | INNOVATION CENTER |
| Issue Date: | 10/29/2020 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS (FORMERLY EATON) |
| Product Line: | McGRAW-EDISON |
| Catalog Number: | TT-D4-740-24VDC-RW-UPL |
| Description: | TOPTIER LED PARKING GARAGE LUMINAIRE WITH UPLIGHT |
| | 4000K, 70 CRI LEDS AND RECTANGULAR DISTRIBUTION |
| Light Source: | - |
| Ballast/Driver: | ELECTRONIC DRIVER |

**Summary**

| | |
|---|---|
| Lumens per Lamp: | N/A |
| Luminaire Lumens: | 6939.7 lumens |
| Efficiency: | N/A |
| Efficacy: | 121.7 lumens/watt |
| Luminous Opening: | Vertical Cylinder (Dia: 1.12' x H: 0.1') |
| IES Classification: | Type IV - Short |
| BUG Rating: | B3 - U4 - G3 |

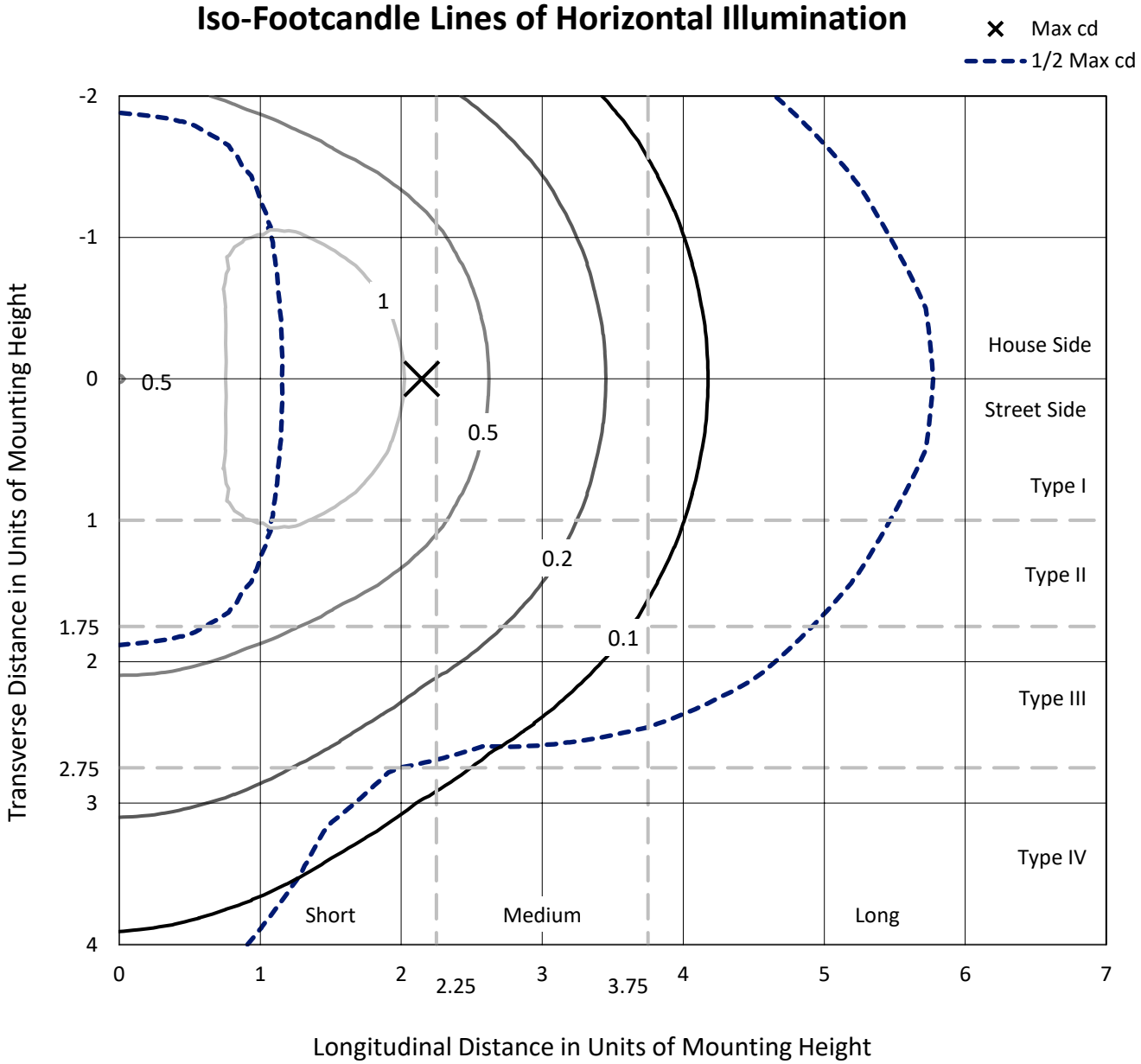
| | |
|---|---|
| Input Watts (W): | 57 |
| Input Voltage (V): | NR |
| Input Current (Ain): | NR |
| Voltage Rise (V): | NR |
| Power Factor: | NR |
| Total Harmonic Distortion (THDi): | NR |
| Frequency (hertz): | 60 |
| Stabilization Time: | NR |
| Operation Time: | NR |
| Ambient Temperature (°C): | NR |
| Test Distance: | 25 FT |

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Scaled Data Report

REPORT NUMBER: P821317
CATALOG NUMBER: TT-D4-740-24VDC-RW-UPL

## Iso-Footcandle Lines of Horizontal Illumination



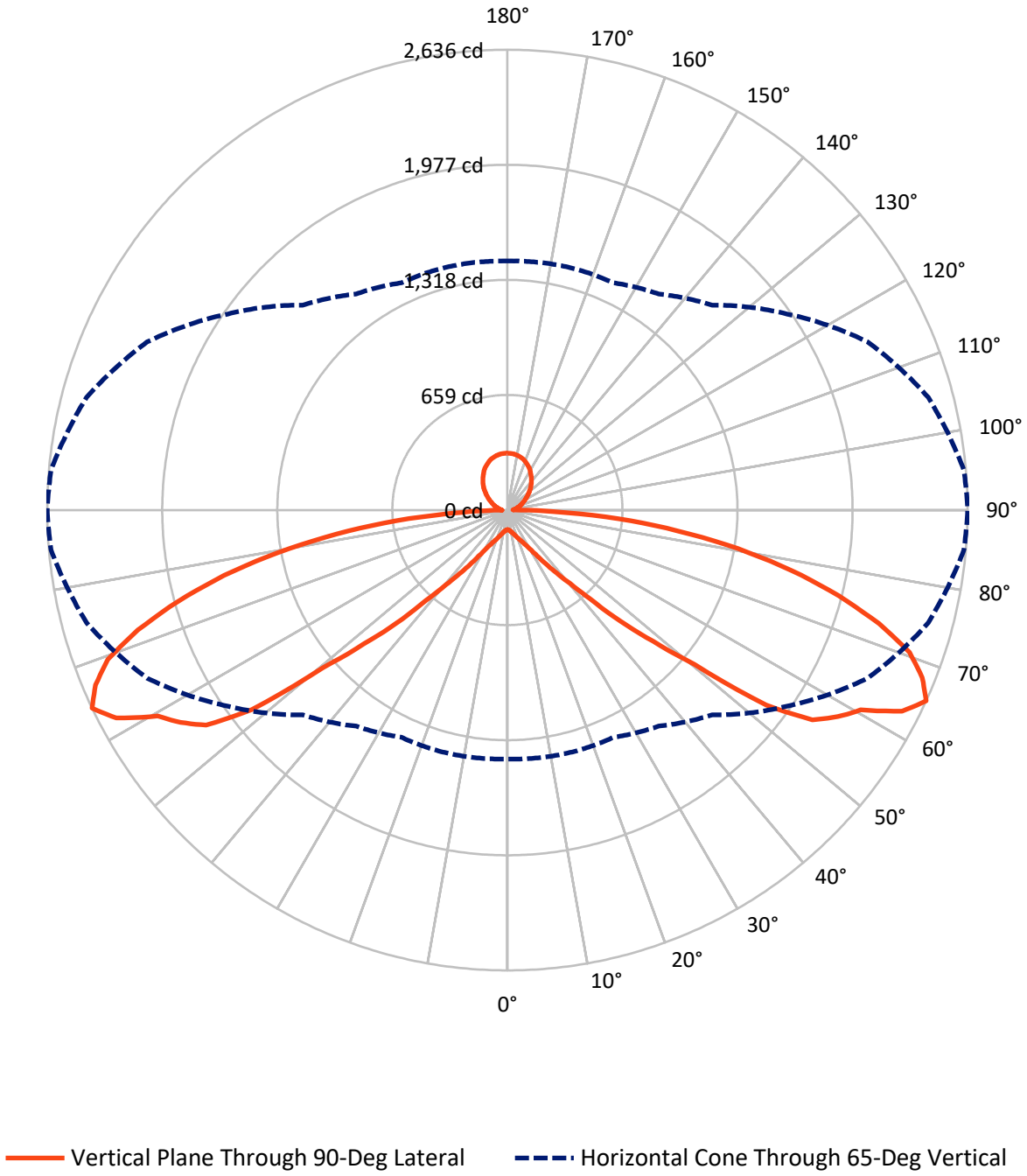

Based on 15 foot mounting height. Maximum calculated value = 1.8 fc
Type IV - Short - N/A

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Scaled Data Report

REPORT NUMBER: P821317
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## Luminous Intensity Polar Plot



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Scaled Data Report

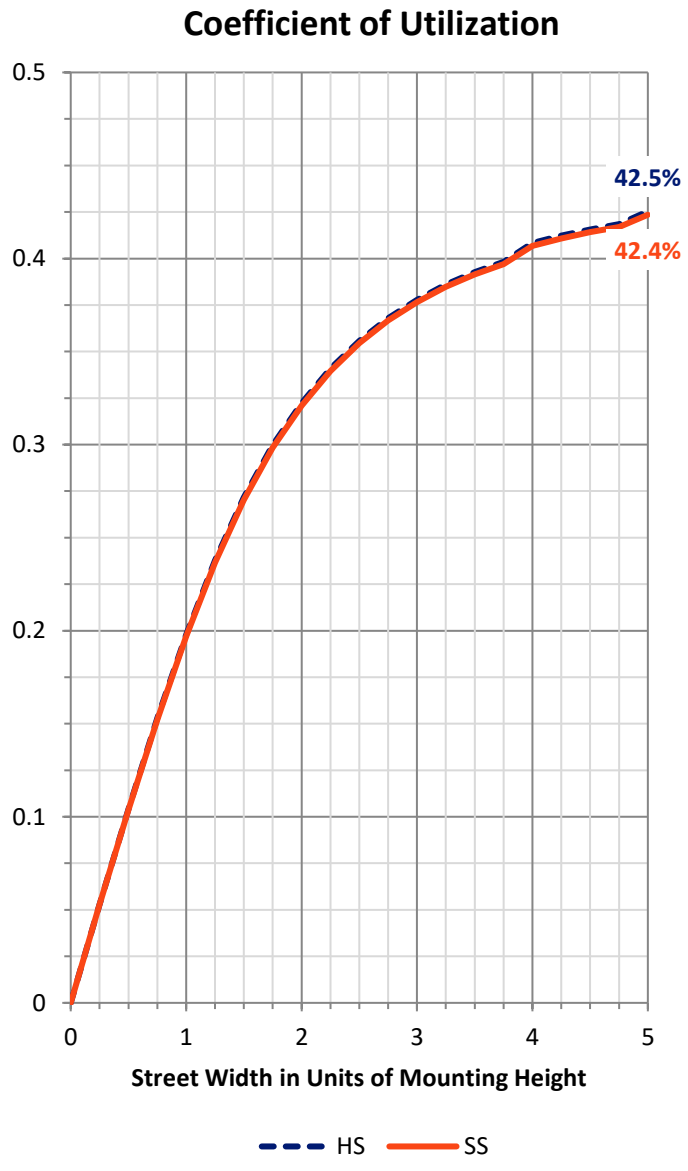
REPORT NUMBER: P821317
CATALOG NUMBER: TT-D4-740-24VDC-RW-UPL

**FLUX DISTRIBUTION:**

| | | Downward | Upward | Total |
|---|---|---|---|---|
| **House Side** | Lumens | 3027.1 | 442.7 | 3469.9 |
| | % Fixture | 43.6 | 6.4 | 50.0 |
| **Street Side** | Lumens | 3027.1 | 442.7 | 3469.9 |
| | % Fixture | 43.6 | 6.4 | 50.0 |
| **Total** | Lumens | 6054.3 | 885.5 | 6939.7 |
| | % Fixture | 87.2 | 12.8 | 100.0 |

**ZONAL LUMENS:**

| Zone | Lumens | % Fixture |
|---|---|---|
| 0°-10° | 11.5 | 0.2 |
| 10°-20° | 43.1 | 0.6 |
| 20°-30° | 99.7 | 1.4 |
| 30°-40° | 225.4 | 3.2 |
| 40°-50° | 549.1 | 7.9 |
| 50°-60° | 1234.8 | 17.8 |
| 60°-70° | 1804.6 | 26.0 |
| 70°-80° | 1572.4 | 22.7 |
| 80°-90° | 513.6 | 7.4 |
| 90°-100° | 45.4 | 0.7 |
| 100°-110° | 70.3 | 1.0 |
| 110°-120° | 97.7 | 1.4 |
| 120°-130° | 126.6 | 1.8 |
| 130°-140° | 147.6 | 2.1 |
| 140°-150° | 149.5 | 2.2 |
| 150°-160° | 129.8 | 1.9 |
| 160°-170° | 87.7 | 1.3 |
| 170°-180° | 30.8 | 0.4 |
| 0°-90° | 6054.3 | 87.2 |
| 0°-180° | 6939.7 | 100.0 |



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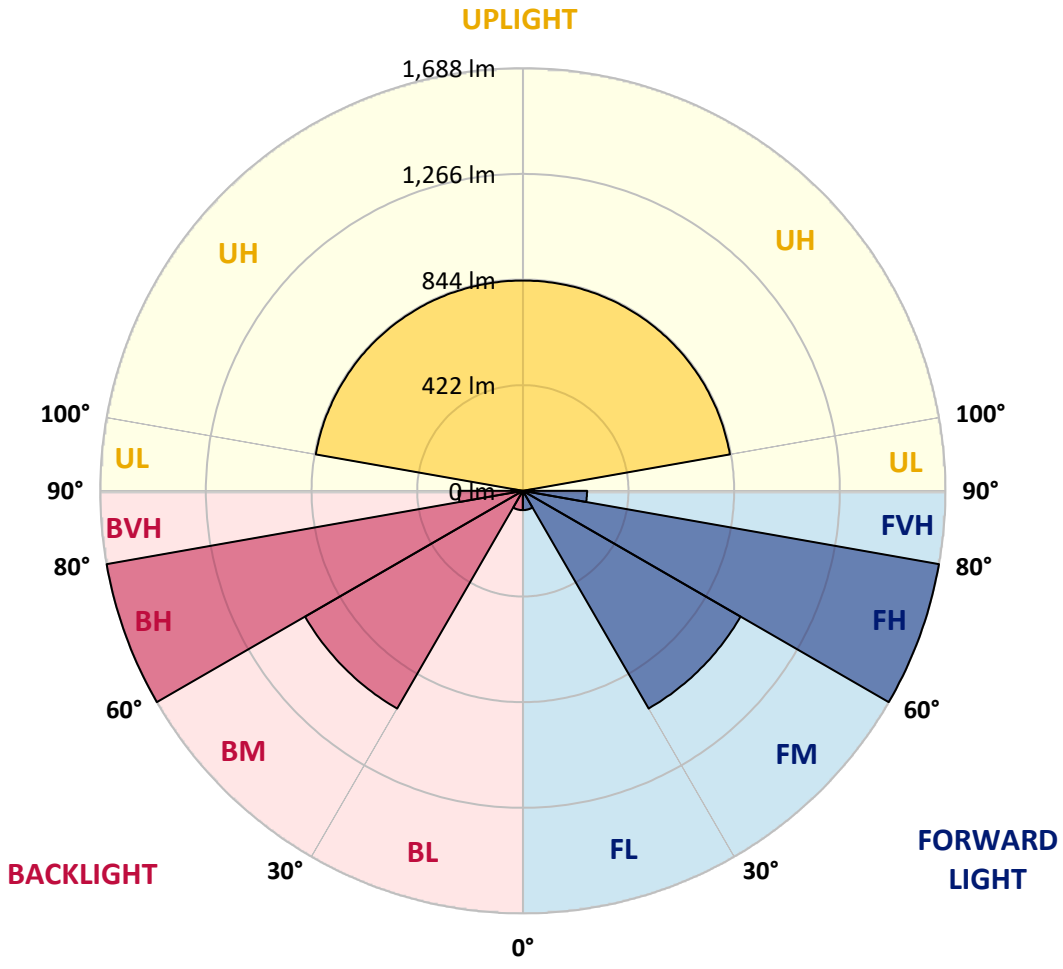
Scaled Data Report

REPORT NUMBER: P821317
CATALOG NUMBER: TT-D4-740-24VDC-RW-UPL

## LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:

| Zone | | Lumens | % Fixture | Zone Rating/Lumen Limit B | U | G |
|---|---|---|---|---|---|---|
| FL | (0°-30°) | 77.2 | 1.1 | | | |
| FM | (30°-60°) | 1004.6 | 14.5 | | | |
| FH | (60°-80°) | 1688.5 | 24.3 | | | G1/1800 |
| FVH | (80°-90°) | 256.8 | 3.7 | | | G3/500 |
| BL | (0°-30°) | 77.2 | 1.1 | B0/110 | | |
| BM | (30°-60°) | 1004.6 | 14.5 | B2/2500 | | |
| BH | (60°-80°) | 1688.5 | 24.3 | B3/2500 | | G3/2500 |
| BVH | (80°-90°) | 256.8 | 3.7 | | | G3/500 |
| UL | (90°-100°) | 45.4 | 0.7 | | U2/50 | |
| UH | (100°-180°) | 840.1 | 12.1 | | U4/1000 | |

**BUG Rating: B3-U4-G3**
Type IV Short



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Scaled Data Report

REPORT NUMBER: P821317
CATALOG NUMBER: TT-D4-740-24VDC-RW-UPL

**CANDELA DISTRIBUTION (FULL):**

| | 0° | 5° | 15° | 25° | 35° | 45° | 55° | 65° | 75° | 85° | 90° |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0° | 110.5 | 110.5 | 110.5 | 110.5 | 110.5 | 110.5 | 110.5 | 110.5 | 110.5 | 110.5 | 110.5 |
| 2.5° | 112.0 | 112.0 | 113.4 | 113.4 | 113.4 | 113.4 | 113.4 | 113.4 | 113.4 | 113.4 | 113.4 |
| 5° | 116.3 | 116.3 | 116.3 | 116.3 | 117.7 | 117.7 | 116.3 | 116.3 | 116.3 | 116.3 | 116.3 |
| 7.5° | 123.5 | 122.0 | 123.5 | 123.5 | 123.5 | 122.0 | 122.0 | 122.0 | 120.6 | 120.6 | 120.6 |
| 10° | 130.6 | 130.6 | 132.1 | 130.6 | 130.6 | 129.2 | 129.2 | 129.2 | 127.8 | 127.8 | 127.8 |
| 12.5° | 140.7 | 140.7 | 140.7 | 140.7 | 139.2 | 139.2 | 137.8 | 136.4 | 134.9 | 134.9 | 134.9 |
| 15° | 153.6 | 152.2 | 152.2 | 150.7 | 149.3 | 147.9 | 146.4 | 146.4 | 145.0 | 145.0 | 145.0 |
| 17.5° | 166.5 | 166.5 | 165.1 | 163.6 | 160.8 | 159.3 | 159.3 | 157.9 | 156.5 | 156.5 | 156.5 |
| 20° | 182.3 | 182.3 | 180.9 | 178.0 | 175.1 | 173.7 | 172.3 | 172.3 | 170.8 | 170.8 | 170.8 |
| 22.5° | 201.0 | 199.5 | 196.7 | 193.8 | 190.9 | 189.5 | 188.1 | 186.6 | 186.6 | 186.6 | 186.6 |
| 25° | 221.1 | 219.6 | 218.2 | 213.9 | 209.6 | 208.1 | 205.3 | 205.3 | 203.8 | 205.3 | 205.3 |
| 27.5° | 245.5 | 244.0 | 241.2 | 236.9 | 231.1 | 228.2 | 226.8 | 226.8 | 228.2 | 228.2 | 229.7 |
| 30° | 275.6 | 272.7 | 269.9 | 264.1 | 258.4 | 254.1 | 254.1 | 255.5 | 259.8 | 262.7 | 262.7 |
| 32.5° | 311.5 | 310.1 | 305.8 | 300.0 | 290.0 | 287.1 | 290.0 | 298.6 | 304.3 | 308.6 | 311.5 |
| 35° | 353.1 | 351.7 | 346.0 | 335.9 | 328.7 | 327.3 | 335.9 | 350.3 | 368.9 | 374.7 | 377.5 |
| 37.5° | 399.1 | 400.5 | 393.3 | 381.8 | 374.7 | 377.5 | 394.8 | 422.0 | 440.7 | 453.6 | 456.5 |
| 40° | 456.5 | 459.4 | 450.8 | 437.8 | 430.7 | 442.1 | 469.4 | 501.0 | 534.0 | 549.8 | 554.1 |
| 42.5° | 524.0 | 528.3 | 516.8 | 503.9 | 499.6 | 518.2 | 557.0 | 608.7 | 667.5 | 686.2 | 693.4 |
| 45° | 607.2 | 610.1 | 595.7 | 584.3 | 581.4 | 614.4 | 680.4 | 766.6 | 859.9 | 902.9 | 910.1 |
| 47.5° | 706.3 | 704.8 | 691.9 | 677.6 | 680.4 | 727.8 | 826.9 | 943.1 | 1042.2 | 1108.2 | 1122.6 |
| 50° | 819.7 | 812.5 | 802.5 | 785.2 | 803.9 | 872.8 | 997.7 | 1138.4 | 1304.9 | 1363.7 | 1389.6 |
| 52.5° | 933.1 | 920.2 | 911.5 | 900.1 | 933.1 | 1022.1 | 1197.2 | 1442.7 | 1693.9 | 1828.8 | 1856.1 |
| 55° | 1035.0 | 1025.0 | 1020.6 | 1022.1 | 1073.8 | 1201.5 | 1431.2 | 1745.6 | 1988.2 | 2100.2 | 2120.3 |
| 57.5° | 1135.5 | 1129.7 | 1125.4 | 1134.1 | 1215.9 | 1382.4 | 1640.8 | 1935.1 | 2134.6 | 2217.9 | 2232.2 |
| 60° | 1230.2 | 1236.0 | 1233.1 | 1258.9 | 1358.0 | 1525.9 | 1749.9 | 2039.9 | 2232.2 | 2308.3 | 2324.1 |
| 62.5° | 1335.0 | 1339.3 | 1339.3 | 1368.0 | 1448.4 | 1596.3 | 1824.5 | 2163.3 | 2407.4 | 2519.3 | 2536.5 |
| 65° | 1425.5 | 1428.3 | 1434.1 | 1435.5 | 1510.2 | 1658.0 | 1956.6 | 2276.7 | 2494.9 | 2624.1 | 2635.6 |
| 67.5° | 1492.9 | 1495.8 | 1488.6 | 1481.4 | 1538.9 | 1672.4 | 1946.6 | 2262.4 | 2456.2 | 2553.8 | 2562.4 |
| 70° | 1547.5 | 1534.6 | 1514.5 | 1478.6 | 1497.2 | 1597.7 | 1863.3 | 2147.5 | 2342.8 | 2430.3 | 2443.2 |
| 72.5° | 1554.7 | 1543.2 | 1480.0 | 1399.6 | 1376.7 | 1464.2 | 1716.9 | 1972.4 | 2140.3 | 2223.6 | 2225.0 |
| 75° | 1511.6 | 1481.4 | 1376.7 | 1256.1 | 1213.0 | 1296.3 | 1513.0 | 1745.6 | 1880.5 | 1950.9 | 1958.0 |
| 77.5° | 1366.6 | 1337.9 | 1205.8 | 1068.0 | 1019.2 | 1091.0 | 1274.7 | 1462.8 | 1592.0 | 1660.9 | 1665.2 |
| 80° | 1109.7 | 1099.6 | 979.0 | 852.7 | 793.8 | 835.5 | 996.2 | 1144.1 | 1248.9 | 1330.7 | 1337.9 |
| 82.5° | 818.2 | 809.6 | 717.8 | 607.2 | 559.8 | 594.3 | 709.1 | 818.2 | 915.9 | 981.9 | 986.2 |
| 85° | 511.0 | 493.8 | 436.4 | 358.9 | 327.3 | 350.3 | 426.3 | 499.6 | 587.1 | 638.8 | 641.7 |
| 87.5° | 170.8 | 163.6 | 140.7 | 116.3 | 97.6 | 101.9 | 124.9 | 152.2 | 222.5 | 245.5 | 259.8 |
| 90° | 32.0 | 31.0 | 31.0 | 31.0 | 31.0 | 31.0 | 31.0 | 31.0 | 31.0 | 31.0 | 31.0 |
| 92.5° | 37.0 | 37.0 | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 | 36.0 |
| 95° | 42.0 | 42.0 | 42.0 | 41.0 | 41.0 | 41.0 | 41.0 | 41.0 | 41.0 | 41.0 | 41.0 |
| 97.5° | 48.0 | 48.0 | 47.0 | 47.0 | 47.0 | 47.0 | 47.0 | 47.0 | 47.0 | 47.0 | 47.0 |
| 100° | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 | 53.0 |
| 102.5° | 60.0 | 59.0 | 60.0 | 60.0 | 59.0 | 59.0 | 59.0 | 60.0 | 60.0 | 60.0 | 59.0 |
| 105° | 66.0 | 66.0 | 66.0 | 66.0 | 66.0 | 66.0 | 66.0 | 67.0 | 66.0 | 66.0 | 66.0 |
| 107.5° | 73.0 | 73.0 | 73.0 | 74.0 | 74.0 | 74.0 | 74.0 | 74.0 | 73.0 | 74.0 | 73.0 |
| 110° | 80.0 | 80.0 | 81.0 | 81.0 | 81.0 | 81.0 | 81.0 | 81.0 | 81.0 | 81.0 | 81.0 |

Cooper Lighting Solutions Photometric Lab
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Scaled Data Report

REPORT NUMBER: P821317
CATALOG NUMBER: TT-D4-740-24VDC-RW-UPL

**CANDELA DISTRIBUTION (continued):**

| | 0° | 5° | 15° | 25° | 35° | 45° | 55° | 65° | 75° | 85° | 90° |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 112.5° | 89.0 | 89.0 | 89.0 | 89.0 | 89.0 | 90.0 | 90.0 | 90.0 | 90.0 | 90.0 | *89.0* |
| 115° | 97.0 | 97.0 | 98.0 | 98.0 | 98.0 | 98.0 | 99.0 | 99.0 | 98.0 | 98.0 | *98.0* |
| 117.5° | 107.0 | 107.0 | 107.0 | 107.0 | 107.0 | 108.0 | 108.0 | 108.0 | 108.0 | 108.0 | *107.0* |
| 120° | 117.0 | 117.0 | 117.0 | 118.0 | 118.0 | 118.0 | 119.0 | 119.0 | 118.0 | 118.0 | *118.0* |
| 122.5° | 129.0 | 128.0 | 129.0 | 129.0 | 129.0 | 129.0 | 130.0 | 130.0 | 130.0 | 130.0 | *129.0* |
| 125° | 140.0 | 140.0 | 141.0 | 141.0 | 141.0 | 141.0 | 142.0 | 142.0 | 142.0 | 142.0 | *141.0* |
| 127.5° | 153.0 | 153.0 | 153.0 | 153.0 | 153.0 | 154.0 | 154.0 | 154.0 | 154.0 | 154.0 | *154.0* |
| 130° | 165.0 | 165.0 | 166.0 | 166.0 | 166.0 | 166.0 | 167.0 | 167.0 | 167.0 | 167.0 | *166.0* |
| 132.5° | 179.0 | 178.0 | 179.0 | 178.0 | 178.0 | 179.0 | 179.0 | 180.0 | 179.0 | 180.0 | *179.0* |
| 135° | 191.0 | 191.0 | 191.0 | 191.0 | 191.0 | 192.0 | 192.0 | 192.0 | 192.0 | 192.0 | *192.0* |
| 137.5° | 204.0 | 203.0 | 204.0 | 203.0 | 203.0 | 204.0 | 204.0 | 204.0 | 204.0 | 204.0 | *204.0* |
| 140° | 216.0 | 215.0 | 216.0 | 215.0 | 216.0 | 216.0 | 216.0 | 216.0 | 216.0 | 216.0 | *216.0* |
| 142.5° | 228.0 | 227.0 | 228.0 | 227.0 | 227.0 | 228.0 | 228.0 | 228.0 | 228.0 | 228.0 | *228.0* |
| 145° | 239.0 | 239.0 | 239.0 | 238.0 | 239.0 | 239.0 | 239.0 | 239.0 | 239.0 | 239.0 | *239.0* |
| 147.5° | 250.0 | 249.0 | 250.0 | 249.0 | 249.0 | 250.0 | 250.0 | 250.0 | 250.0 | 250.0 | *250.0* |
| 150° | 263.0 | 262.0 | 263.0 | 262.0 | 263.0 | 263.0 | 263.0 | 263.0 | 263.0 | 263.0 | *263.0* |
| 152.5° | 273.0 | 273.0 | 273.0 | 273.0 | 273.0 | 273.0 | 273.0 | 273.0 | 273.0 | 273.0 | *273.0* |
| 155° | 282.0 | 282.0 | 283.0 | 282.0 | 282.0 | 282.0 | 283.0 | 282.0 | 282.0 | 282.0 | *282.0* |
| 157.5° | 290.0 | 290.0 | 290.0 | 290.0 | 290.0 | 290.0 | 291.0 | 291.0 | 290.0 | 291.0 | *290.0* |
| 160° | 298.0 | 298.0 | 299.0 | 298.0 | 298.0 | 298.0 | 299.0 | 298.0 | 298.0 | 298.0 | *298.0* |
| 162.5° | 306.0 | 305.0 | 306.0 | 305.0 | 306.0 | 306.0 | 306.0 | 306.0 | 306.0 | 306.0 | *306.0* |
| 165° | 311.0 | 311.0 | 312.0 | 311.0 | 311.0 | 311.0 | 312.0 | 311.0 | 311.0 | 311.0 | *311.0* |
| 167.5° | 316.0 | 315.0 | 316.0 | 316.0 | 316.0 | 316.0 | 316.0 | 316.0 | 316.0 | 316.0 | *316.0* |
| 170° | 319.0 | 319.0 | 320.0 | 319.0 | 319.0 | 319.0 | 320.0 | 319.0 | 319.0 | 319.0 | *319.0* |
| 172.5° | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | *323.0* |
| 175° | 324.0 | 324.0 | 325.0 | 324.0 | 325.0 | 324.0 | 325.0 | 324.0 | 324.0 | 324.0 | *324.0* |
| 177.5° | 325.0 | 325.0 | 326.0 | 325.0 | 325.0 | 325.0 | 325.0 | 325.0 | 325.0 | 325.0 | *325.0* |
| 180° | 326.0 | 326.0 | 326.0 | 326.0 | 326.0 | 326.0 | 326.0 | 326.0 | 326.0 | 326.0 | *326.0* |

Cooper Lighting Solutions Photometric Lab
1121 Highway 74 South
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# LM-79-2019: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

Streetworks

Report Number: SP1-2407-176-5

Test Date: 09/24/2024

Luminaire Tested: MEM2-HTN-VA-30-740-U-WQ

Data in this report applies to families of products including MEM2-HTN-VA-30-740-U-WQ

Report Generated By FNC07603 / LDUCLS01DT446
Version: v7.04

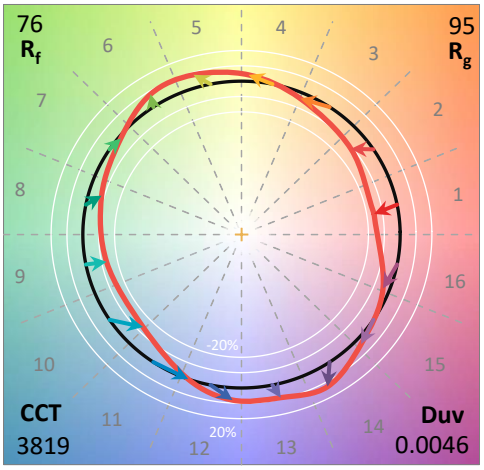
## Test Information

| | |
|---|---|
| Test Method: | LM-79-2019 |
| Report Number: | SP1-2407-176-5 |
| 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-30-740-U-WQ** |
| Description: | EPIC MODERN VISUAL COMFORT 30W WAVESTREAM WIDE |

## Spectral Parameters

| | | | | | |
|---|---|---|---|---|---|
| CCT (K): | 3819 | CRI (Ra): | 72.9 | | |
| CIE u': | 0.2261 | R1: | 70.1 | R9: | -21.5 |
| CIE v': | 0.5108 | R2: | 78.4 | R10: | 48.5 |
| Duv: | 0.0046 | R3: | 85.0 | R11: | 68.4 |
| CIE x: | 0.3926 | R4: | 72.9 | R12: | 39.0 |
| CIE y: | 0.3942 | R5: | 69.1 | R13: | 71.1 |
| CIE z: | 0.2132 | R6: | 69.2 | R14: | 91.3 |
| Peak Wavelength (nm): | 450 | R7: | 82.8 | R15: | 63.2 |
| Dominant Wavelength (nm): | 577 | R8: | 55.4 | | |
| Purity: | 36.15483 | | | | |

| | |
|---|---|
| Rf: | 75.6 |
| Rg: | 94.8 |




## Test Conditions

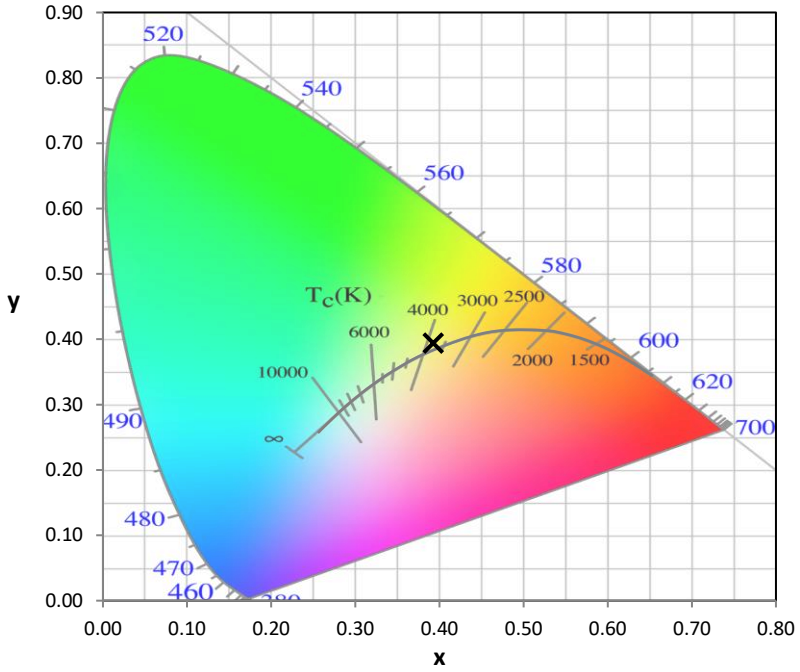
| | |
|---|---|
| Stabilization Time: | 30M |
| Operation Time: | 1H 30M |
| Sphere Temperature (°C): | 25.2 |

REPORT NUMBER: SP1-2407-176-5

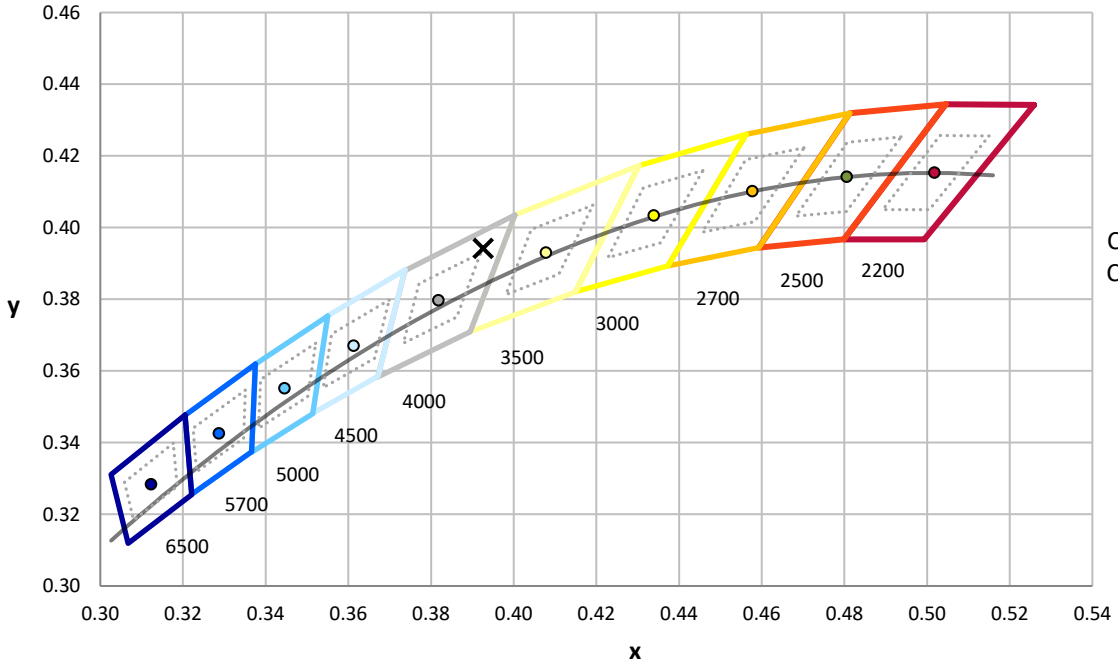
| Measurement and Test Equipment | | | |
|---|---|---|---|
| Instrument | Identification Number | Calibration Date | Calibration Due Date |
| Photometer | IN0058 | 6/18/2024 | 12/18/2024 |
| Power Meter | INXT2011004 | 2/8/2024 | 2/8/2025 |
| AC Power Source | IN0063 | 10/24/2023 | 10/24/2024 |
| DC 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: SP1-2407-176-5

## CIE 1931 Chromaticity Diagram




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

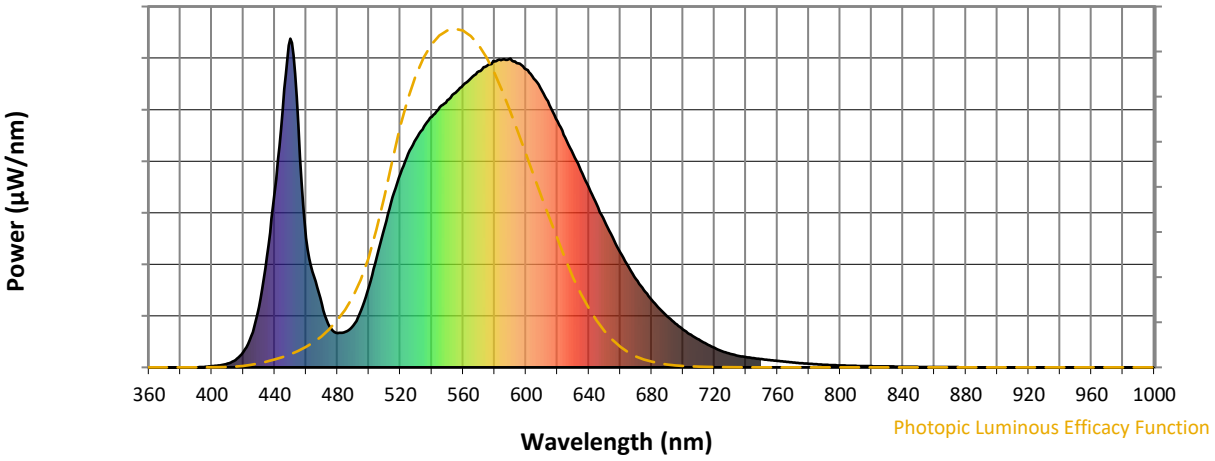



CCT = 3819K
CIE x = 0.3926
CIE y = 0.3942
Duv = 0.0046

Point lies inside the ANSI 4000K 7-step quadrangle

REPORT NUMBER: SP1-2407-176-5

## Photopic Flux vs. Wavelength

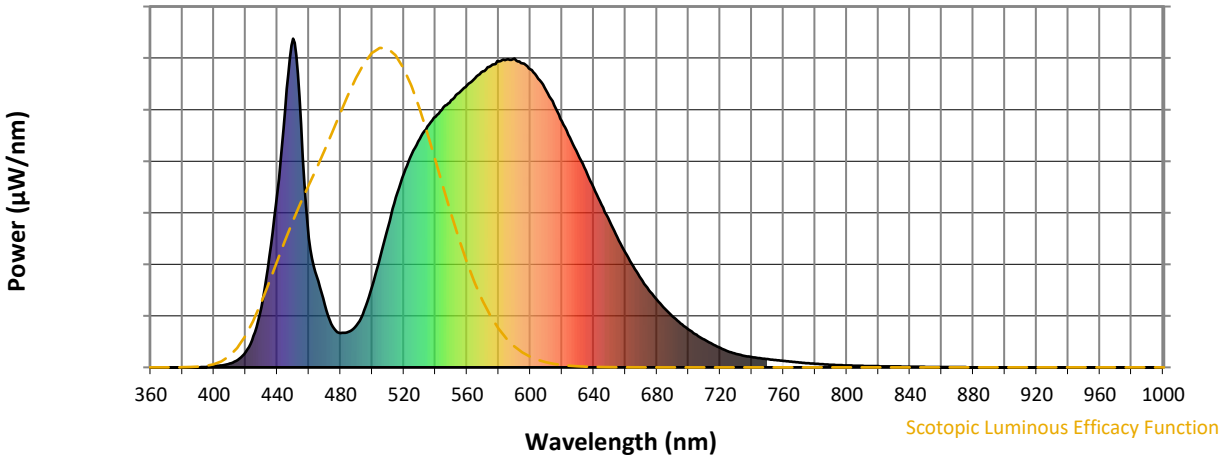



## Photopic Lumens: NR

| 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 | 127 | NR | 620 | 748 | NR | 750 | 25 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 173 | NR | 625 | 699 | NR | 755 | 22 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 246 | NR | 630 | 648 | NR | 760 | 20 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 335 | NR | 635 | 599 | NR | 765 | 17 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 427 | NR | 640 | 547 | NR | 770 | 15 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 517 | NR | 645 | 495 | NR | 775 | 13 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 589 | NR | 650 | 445 | NR | 780 | 11 | NR | 910 | 0 | NR |
| 395 | 1 | NR | 525 | 649 | NR | 655 | 396 | NR | 785 | 9 | NR | 915 | 0 | NR |
| 400 | 4 | NR | 530 | 695 | NR | 660 | 349 | NR | 790 | 8 | NR | 920 | 0 | NR |
| 405 | 6 | NR | 535 | 733 | NR | 665 | 308 | NR | 795 | 7 | NR | 925 | 0 | NR |
| 410 | 11 | NR | 540 | 763 | NR | 670 | 269 | NR | 800 | 6 | NR | 930 | 0 | NR |
| 415 | 23 | NR | 545 | 792 | NR | 675 | 235 | NR | 805 | 5 | NR | 935 | 0 | NR |
| 420 | 46 | NR | 550 | 813 | NR | 680 | 205 | NR | 810 | 5 | NR | 940 | 0 | NR |
| 425 | 95 | NR | 555 | 835 | NR | 685 | 178 | NR | 815 | 4 | NR | 945 | 0 | NR |
| 430 | 183 | NR | 560 | 859 | NR | 690 | 155 | NR | 820 | 3 | NR | 950 | 0 | NR |
| 435 | 338 | NR | 565 | 880 | NR | 695 | 134 | NR | 825 | 3 | NR | 955 | 0 | NR |
| 440 | 534 | NR | 570 | 900 | NR | 700 | 115 | NR | 830 | 3 | NR | 960 | 0 | NR |
| 445 | 782 | NR | 575 | 918 | NR | 705 | 99 | NR | 835 | 2 | NR | 965 | 0 | NR |
| 450 | 1000 | NR | 580 | 931 | NR | 710 | 84 | NR | 840 | 2 | NR | 970 | 0 | NR |
| 455 | 739 | NR | 585 | 937 | NR | 715 | 71 | NR | 845 | 2 | NR | 975 | 0 | NR |
| 460 | 393 | NR | 590 | 939 | NR | 720 | 59 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 276 | NR | 595 | 925 | NR | 725 | 49 | NR | 855 | 1 | NR | 985 | 0 | NR |
| 470 | 190 | NR | 600 | 907 | NR | 730 | 41 | NR | 860 | 1 | NR | 990 | 0 | NR |
| 475 | 123 | NR | 605 | 878 | NR | 735 | 35 | NR | 865 | 1 | NR | 995 | 0 | NR |
| 480 | 105 | NR | 610 | 842 | NR | 740 | 31 | NR | 870 | 1 | NR | 1000 | 0 | NR |
| 485 | 108 | NR | 615 | 797 | NR | 745 | 28 | NR | 875 | 1 | NR | | | |

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## Scotopic Flux vs. Wavelength

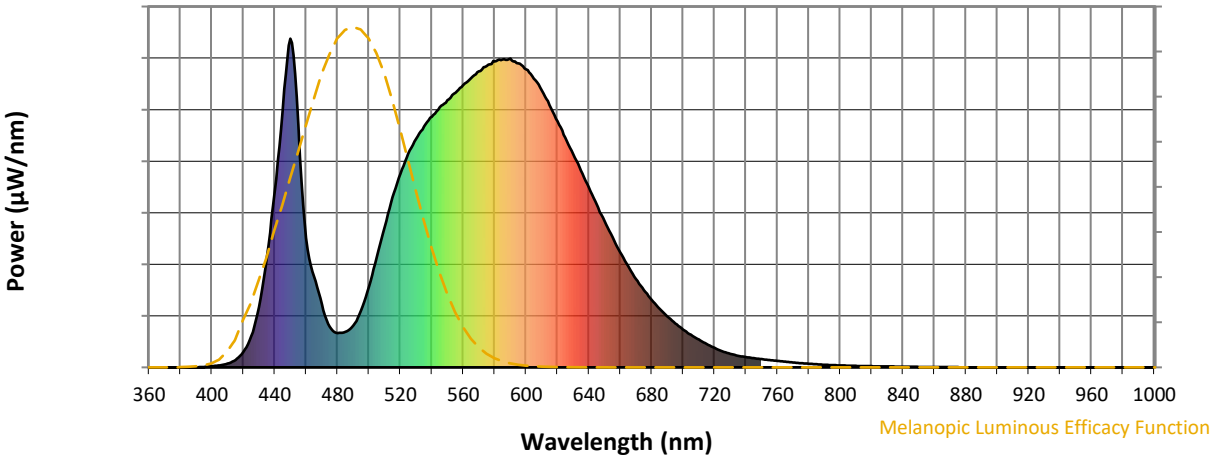



**Scotopic Lumens: NR** **S/P: 1.45**

| λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) | λ (nm) | Power W^/nm | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 0 | NR | 490 | 127 | NR | 620 | 748 | NR | 750 | 25 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 173 | NR | 625 | 699 | NR | 755 | 22 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 246 | NR | 630 | 648 | NR | 760 | 20 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 335 | NR | 635 | 599 | NR | 765 | 17 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 427 | NR | 640 | 547 | NR | 770 | 15 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 517 | NR | 645 | 495 | NR | 775 | 13 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 589 | NR | 650 | 445 | NR | 780 | 11 | NR | 910 | 0 | NR |
| 395 | 1 | NR | 525 | 649 | NR | 655 | 396 | NR | 785 | 9 | NR | 915 | 0 | NR |
| 400 | 4 | NR | 530 | 695 | NR | 660 | 349 | NR | 790 | 8 | NR | 920 | 0 | NR |
| 405 | 6 | NR | 535 | 733 | NR | 665 | 308 | NR | 795 | 7 | NR | 925 | 0 | NR |
| 410 | 11 | NR | 540 | 763 | NR | 670 | 269 | NR | 800 | 6 | NR | 930 | 0 | NR |
| 415 | 23 | NR | 545 | 792 | NR | 675 | 235 | NR | 805 | 5 | NR | 935 | 0 | NR |
| 420 | 46 | NR | 550 | 813 | NR | 680 | 205 | NR | 810 | 5 | NR | 940 | 0 | NR |
| 425 | 95 | NR | 555 | 835 | NR | 685 | 178 | NR | 815 | 4 | NR | 945 | 0 | NR |
| 430 | 183 | NR | 560 | 859 | NR | 690 | 155 | NR | 820 | 3 | NR | 950 | 0 | NR |
| 435 | 338 | NR | 565 | 880 | NR | 695 | 134 | NR | 825 | 3 | NR | 955 | 0 | NR |
| 440 | 534 | NR | 570 | 900 | NR | 700 | 115 | NR | 830 | 3 | NR | 960 | 0 | NR |
| 445 | 782 | NR | 575 | 918 | NR | 705 | 99 | NR | 835 | 2 | NR | 965 | 0 | NR |
| 450 | 1000 | NR | 580 | 931 | NR | 710 | 84 | NR | 840 | 2 | NR | 970 | 0 | NR |
| 455 | 739 | NR | 585 | 937 | NR | 715 | 71 | NR | 845 | 2 | NR | 975 | 0 | NR |
| 460 | 393 | NR | 590 | 939 | NR | 720 | 59 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 276 | NR | 595 | 925 | NR | 725 | 49 | NR | 855 | 1 | NR | 985 | 0 | NR |
| 470 | 190 | NR | 600 | 907 | NR | 730 | 41 | NR | 860 | 1 | NR | 990 | 0 | NR |
| 475 | 123 | NR | 605 | 878 | NR | 735 | 35 | NR | 865 | 1 | NR | 995 | 0 | NR |
| 480 | 105 | NR | 610 | 842 | NR | 740 | 31 | NR | 870 | 1 | NR | 1000 | 0 | NR |
| 485 | 108 | NR | 615 | 797 | NR | 745 | 28 | NR | 875 | 1 | NR | | | |

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## Melanopic Flux vs. Wavelength




**Melanopic Lumens: NR** **M/P: 2.76**

| 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 | 127 | NR | 620 | 748 | NR | 750 | 25 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 173 | NR | 625 | 699 | NR | 755 | 22 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 246 | NR | 630 | 648 | NR | 760 | 20 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 335 | NR | 635 | 599 | NR | 765 | 17 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 427 | NR | 640 | 547 | NR | 770 | 15 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 517 | NR | 645 | 495 | NR | 775 | 13 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 589 | NR | 650 | 445 | NR | 780 | 11 | NR | 910 | 0 | NR |
| 395 | 1 | NR | 525 | 649 | NR | 655 | 396 | NR | 785 | 9 | NR | 915 | 0 | NR |
| 400 | 4 | NR | 530 | 695 | NR | 660 | 349 | NR | 790 | 8 | NR | 920 | 0 | NR |
| 405 | 6 | NR | 535 | 733 | NR | 665 | 308 | NR | 795 | 7 | NR | 925 | 0 | NR |
| 410 | 11 | NR | 540 | 763 | NR | 670 | 269 | NR | 800 | 6 | NR | 930 | 0 | NR |
| 415 | 23 | NR | 545 | 792 | NR | 675 | 235 | NR | 805 | 5 | NR | 935 | 0 | NR |
| 420 | 46 | NR | 550 | 813 | NR | 680 | 205 | NR | 810 | 5 | NR | 940 | 0 | NR |
| 425 | 95 | NR | 555 | 835 | NR | 685 | 178 | NR | 815 | 4 | NR | 945 | 0 | NR |
| 430 | 183 | NR | 560 | 859 | NR | 690 | 155 | NR | 820 | 3 | NR | 950 | 0 | NR |
| 435 | 338 | NR | 565 | 880 | NR | 695 | 134 | NR | 825 | 3 | NR | 955 | 0 | NR |
| 440 | 534 | NR | 570 | 900 | NR | 700 | 115 | NR | 830 | 3 | NR | 960 | 0 | NR |
| 445 | 782 | NR | 575 | 918 | NR | 705 | 99 | NR | 835 | 2 | NR | 965 | 0 | NR |
| 450 | 1000 | NR | 580 | 931 | NR | 710 | 84 | NR | 840 | 2 | NR | 970 | 0 | NR |
| 455 | 739 | NR | 585 | 937 | NR | 715 | 71 | NR | 845 | 2 | NR | 975 | 0 | NR |
| 460 | 393 | NR | 590 | 939 | NR | 720 | 59 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 276 | NR | 595 | 925 | NR | 725 | 49 | NR | 855 | 1 | NR | 985 | 0 | NR |
| 470 | 190 | NR | 600 | 907 | NR | 730 | 41 | NR | 860 | 1 | NR | 990 | 0 | NR |
| 475 | 123 | NR | 605 | 878 | NR | 735 | 35 | NR | 865 | 1 | NR | 995 | 0 | NR |
| 480 | 105 | NR | 610 | 842 | NR | 740 | 31 | NR | 870 | 1 | NR | 1000 | 0 | NR |
| 485 | 108 | NR | 615 | 797 | NR | 745 | 28 | NR | 875 | 1 | NR | | | |

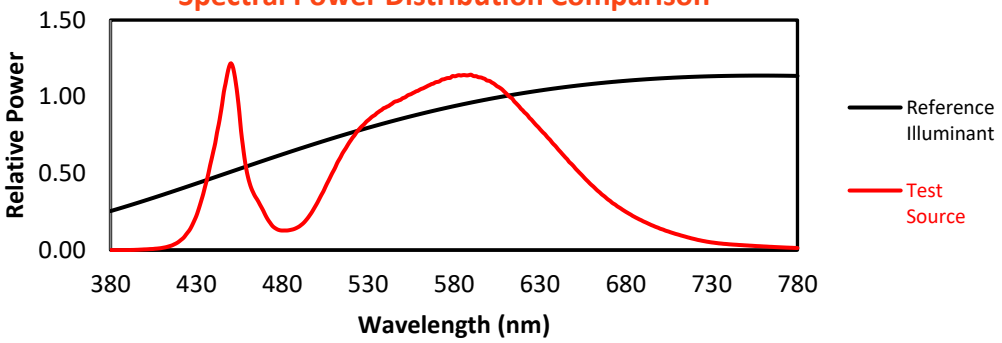
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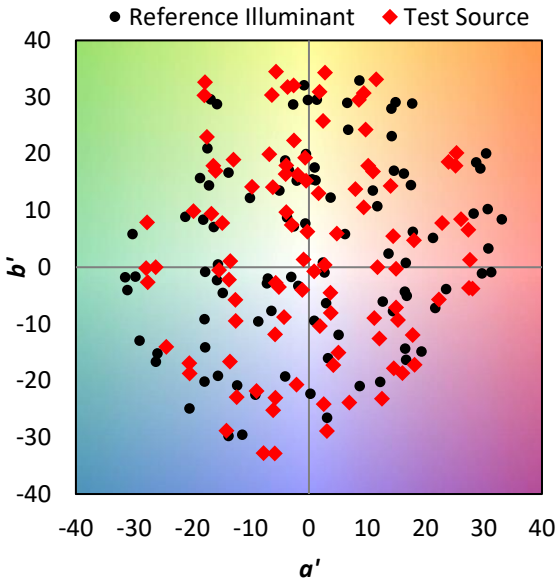
## Summary

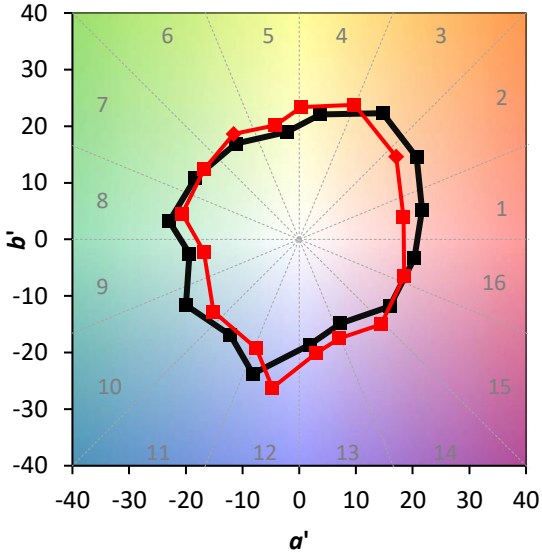
$R_f$ = 75.6
$R_g$ = 94.8
CIE $R_a$ = 72.9
$R_9$ = -21.5

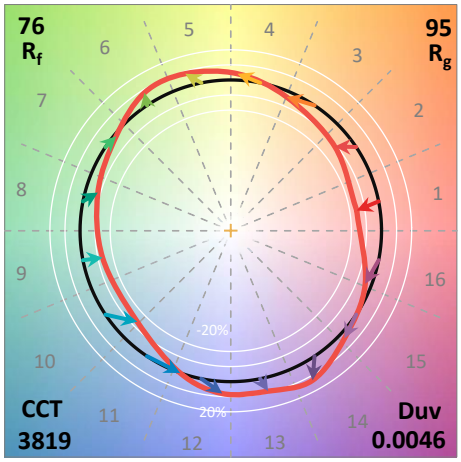
## Spectral Power Distribution Comparison

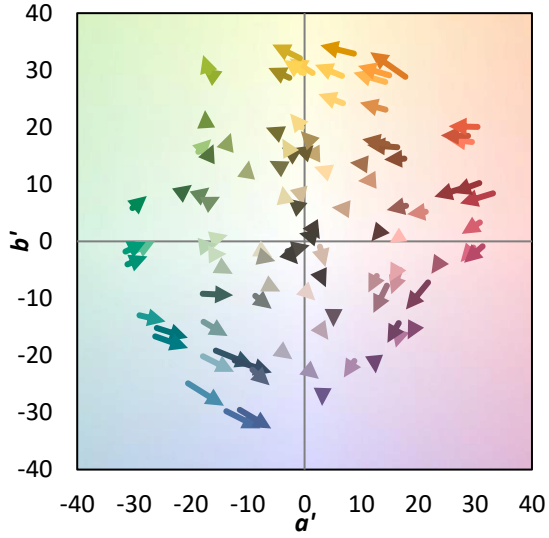



## Color Vector Graphics



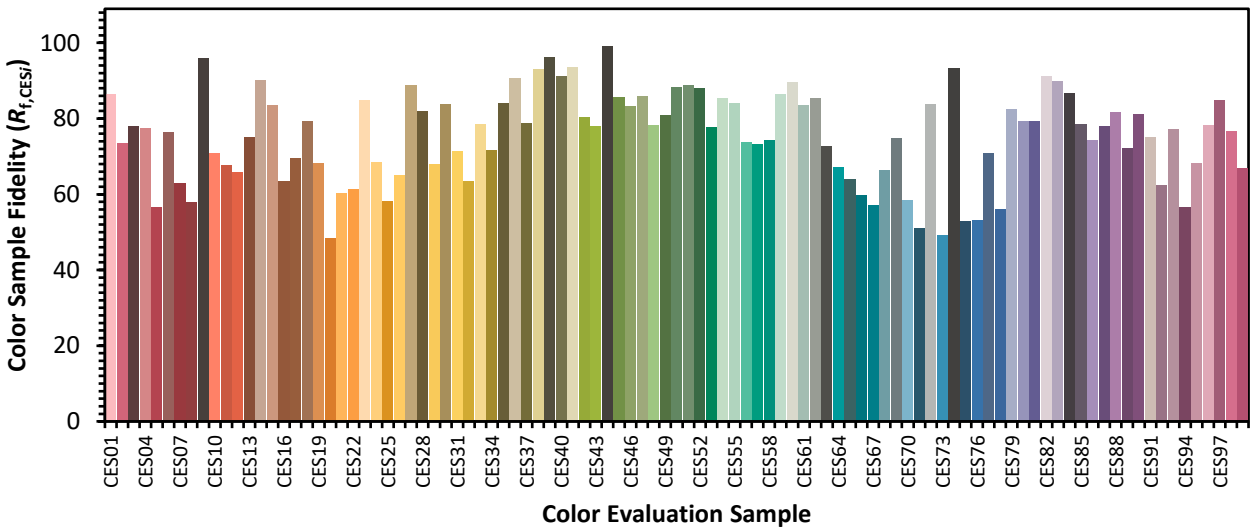



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**Individual Sample Fidelity Index ($R_{f,i}$)**

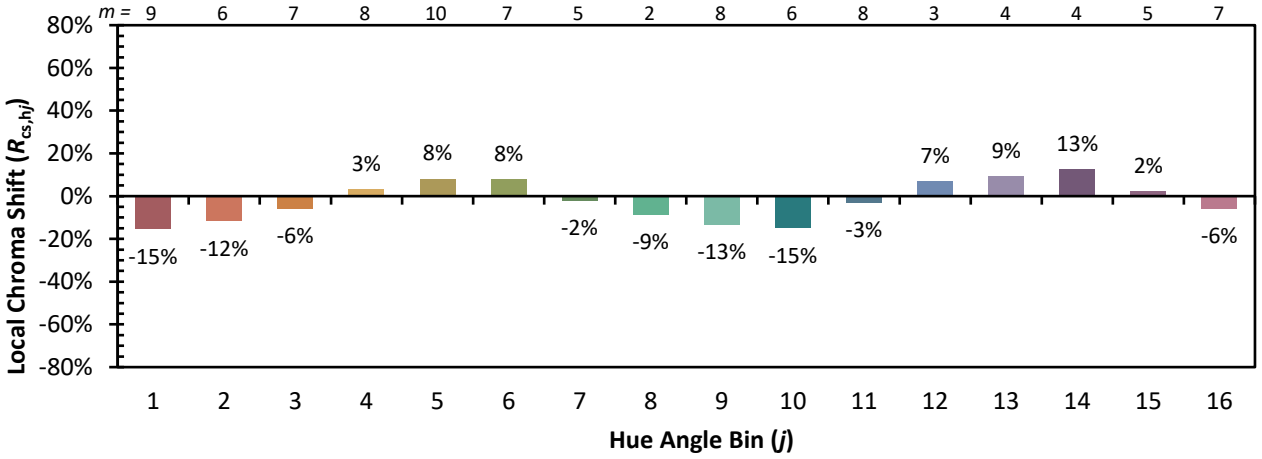
| | | | |
|---|---|---|---|
| CES01 = 85 | CES26 = 65 | CES51 = 89 | CES76 = 53 |
| CES02 = 61 | CES27 = 89 | CES52 = 88 | CES77 = 71 |
| CES03 = 30 | CES28 = 82 | CES53 = 78 | CES78 = 56 |
| CES04 = 70 | CES29 = 68 | CES54 = 85 | CES79 = 83 |
| CES05 = 48 | CES30 = 84 | CES55 = 84 | CES80 = 79 |
| CES06 = 50 | CES31 = 71 | CES56 = 74 | CES81 = 79 |
| CES07 = 40 | CES32 = 63 | CES57 = 73 | CES82 = 91 |
| CES08 = 39 | CES33 = 79 | CES58 = 74 | CES83 = 90 |
| CES09 = 29 | CES34 = 72 | CES59 = 86 | CES84 = 87 |
| CES10 = 74 | CES35 = 84 | CES60 = 90 | CES85 = 78 |
| CES11 = 57 | CES36 = 91 | CES61 = 84 | CES86 = 74 |
| CES12 = 63 | CES37 = 79 | CES62 = 85 | CES87 = 78 |
| CES13 = 42 | CES38 = 93 | CES63 = 73 | CES88 = 82 |
| CES14 = 74 | CES39 = 96 | CES64 = 67 | CES89 = 72 |
| CES15 = 71 | CES40 = 91 | CES65 = 64 | CES90 = 81 |
| CES16 = 47 | CES41 = 93 | CES66 = 60 | CES91 = 75 |
| CES17 = 49 | CES42 = 80 | CES67 = 57 | CES92 = 62 |
| CES18 = 56 | CES43 = 78 | CES68 = 66 | CES93 = 77 |
| CES19 = 72 | CES44 = 99 | CES69 = 75 | CES94 = 57 |
| CES20 = 65 | CES45 = 86 | CES70 = 58 | CES95 = 68 |
| CES21 = 86 | CES46 = 83 | CES71 = 51 | CES96 = 78 |
| CES22 = 78 | CES47 = 86 | CES72 = 84 | CES97 = 85 |
| CES23 = 92 | CES48 = 78 | CES73 = 49 | CES98 = 77 |
| CES24 = 91 | CES49 = 81 | CES74 = 93 | CES99 = 67 |
| CES25 = 72 | CES50 = 88 | CES75 = 53 | |

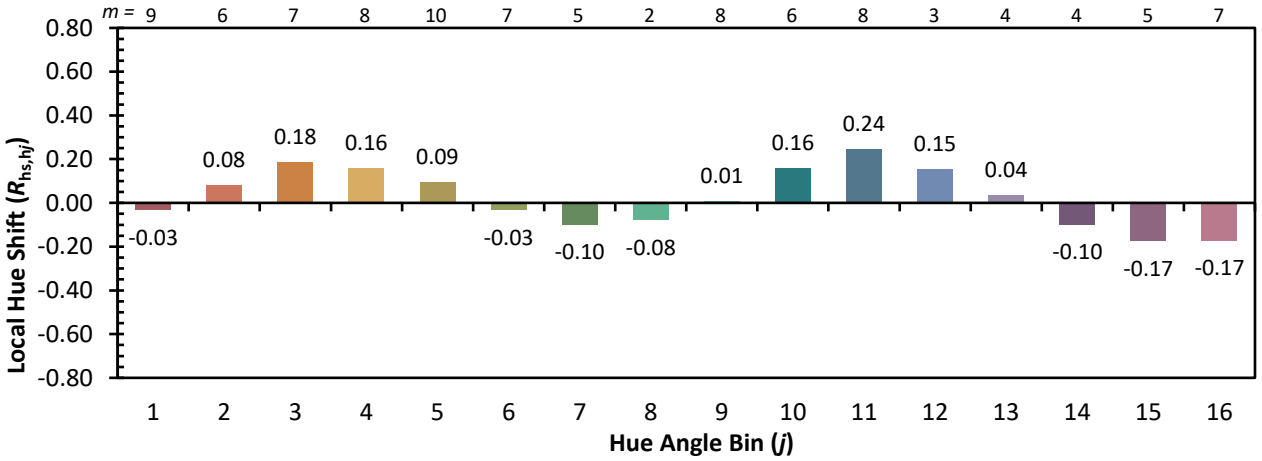


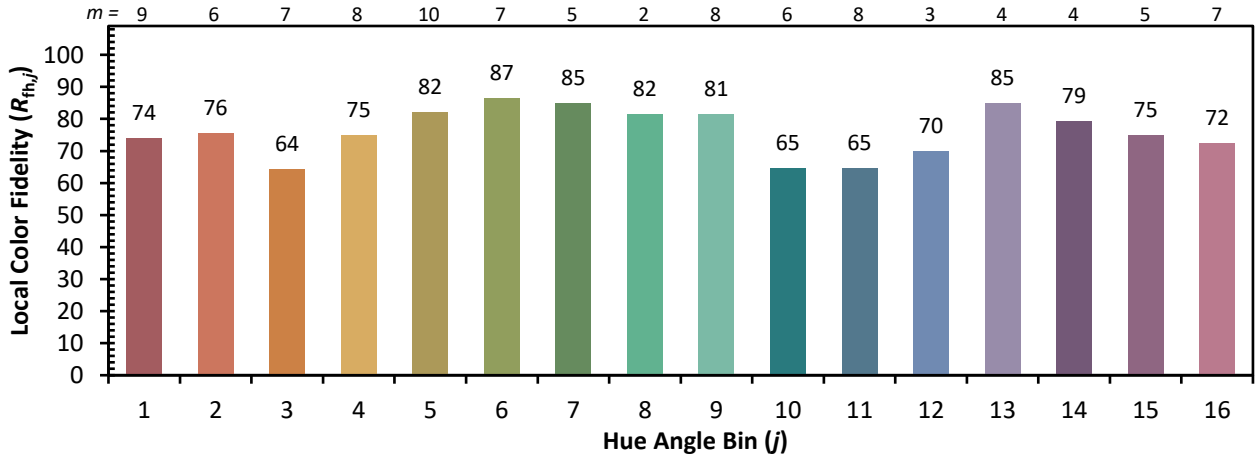
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## Color Rendition by Hue-Angle Bin



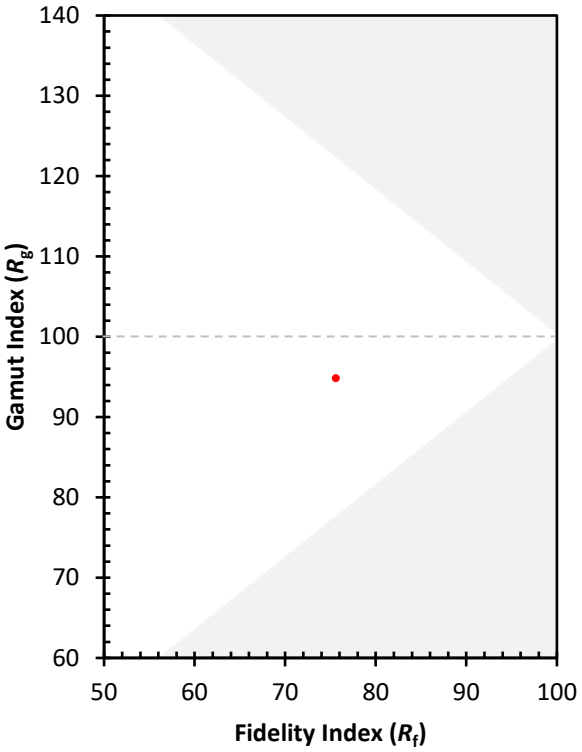



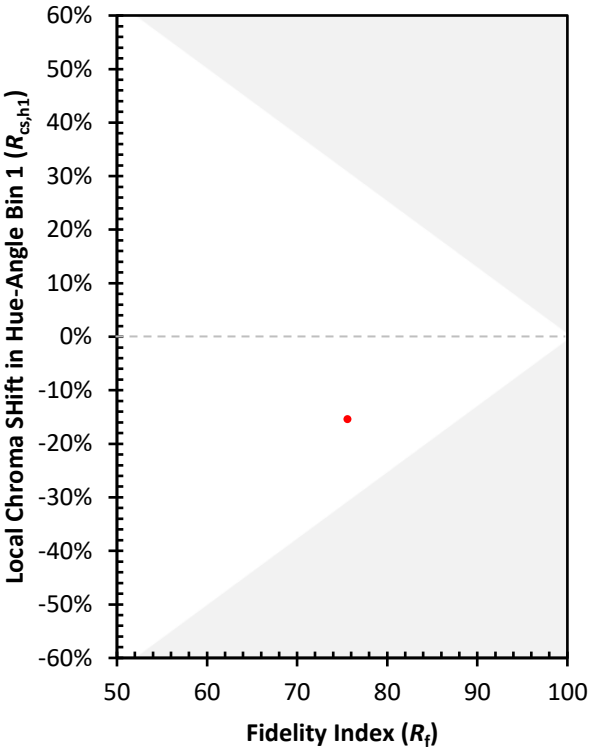



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## Measure Comparisons




(END OF REPORT)