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: P833330

Luminaire Tested: **TTN-D1-830-U-RW-UPL2**

Issue Date: 5/15/2024

Report Generated By 670246001

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: | P833330 |
| | REPORT IS FROM IESNA LM-79-08 TEST DATA - UPLIGHT (G3-2308-121-4) AND |
| Test Lab: | INNOVATION CENTER |
| Issue Date: | 5/15/2024 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS (FORMERLY EATON) |
| Product Line: | McGRAW-EDISON |
| Catalog Number: | TTN-D1-830-U-RW-UPL2 |
| Description: | TOPTIER NANO LED PARKING GARAGE LUMINAIRE WITH UPLIGHT |
| | 3000K, 80 CRI LEDS AND RECTANGULAR DISTRIBUTION |
| Light Source: | - |
| Ballast/Driver: | - |

**Summary**

| | |
|---|---|
| Lumens per Lamp: | N/A |
| Luminaire Lumens: | 3471.8 lumens |
| Efficiency: | N/A |
| Efficacy: | 112.4 lumens/watt |
| Luminous Opening: | Vertical Cylinder (Dia: 0.71' x H: 0.1') |
| IES Classification: | Type II - Short |
| BUG Rating: | B2 - U4 - G2 |

| | |
|---|---|
| Input Watts (W): | 30.9 |
| 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: | 24 FT |

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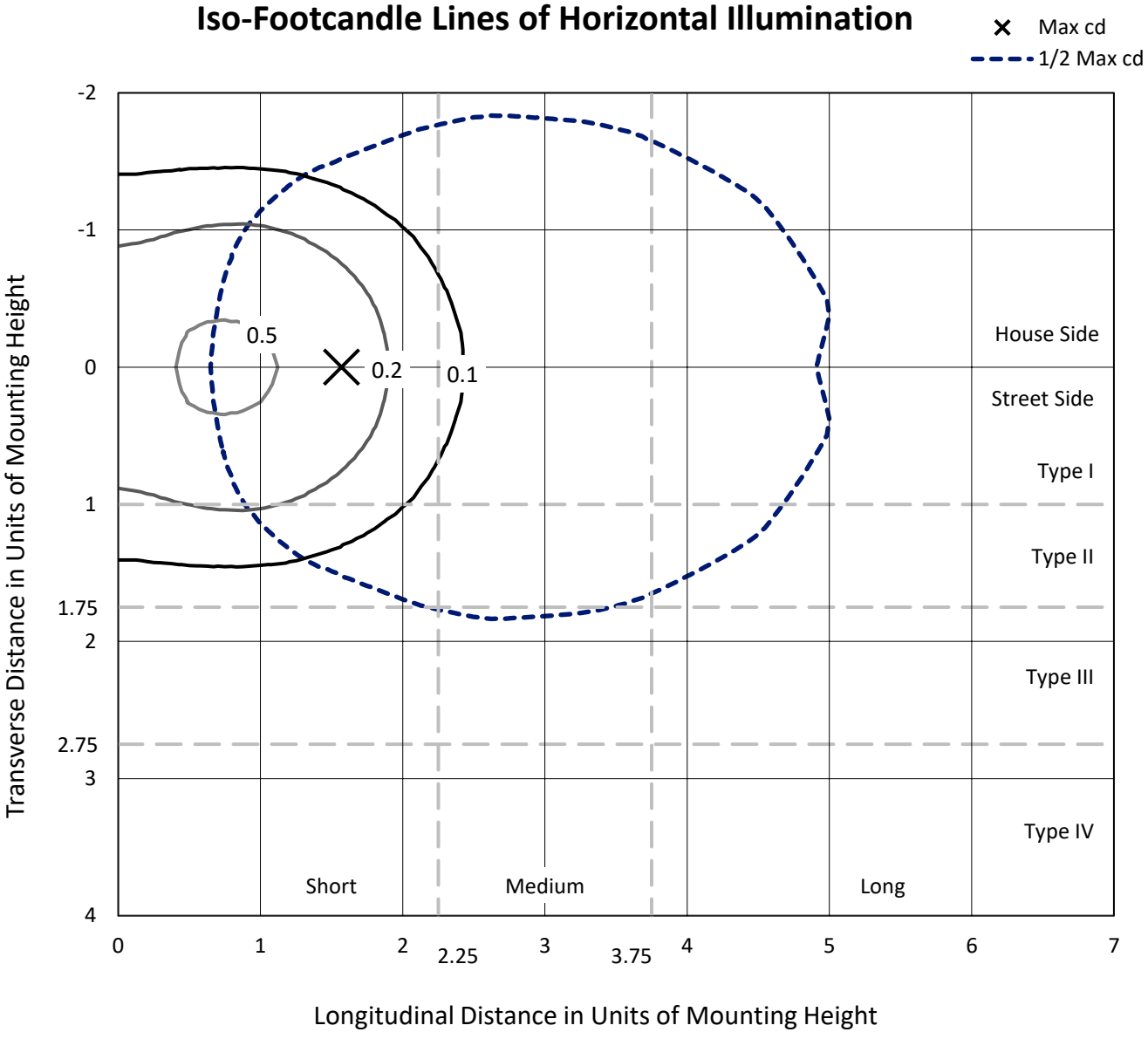
Scaled Data Report

REPORT NUMBER: P833330
CATALOG NUMBER: TTN-D1-830-U-RW-UPL2

## Iso-Footcandle Lines of Horizontal Illumination




Based on 25 foot mounting height. Maximum calculated value = 0.6 fc
Type II - Short - N/A

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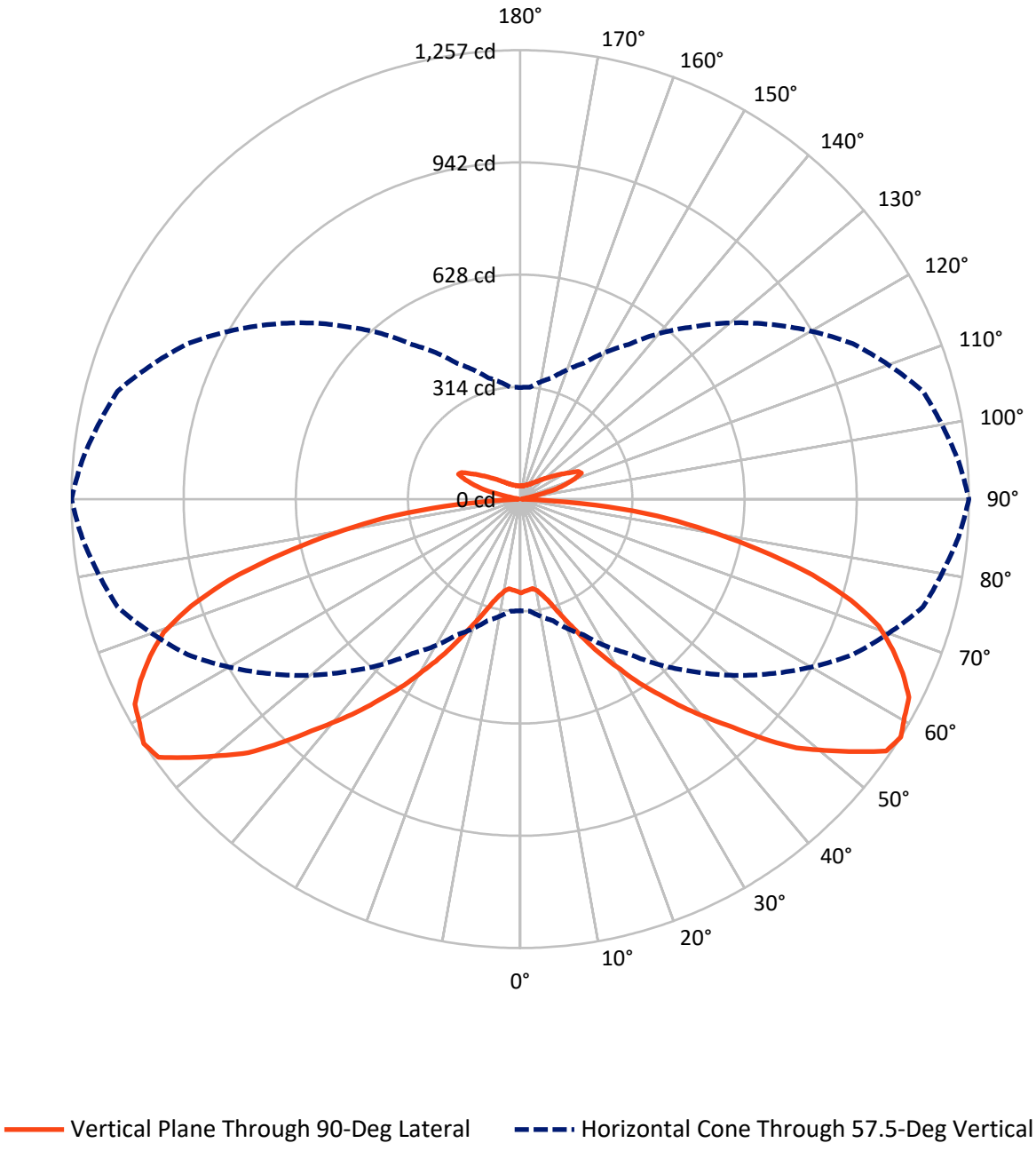
Scaled Data Report

REPORT NUMBER: P833330
CATALOG NUMBER: TTN-D1-830-U-RW-UPL2

## Luminous Intensity Polar Plot



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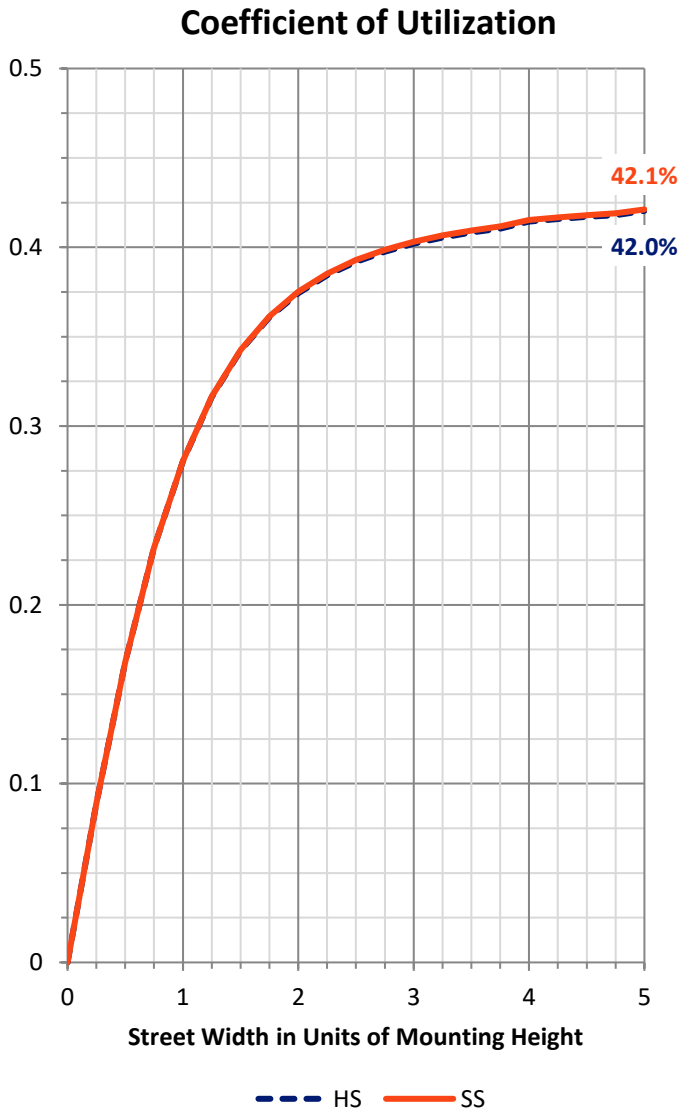
REPORT NUMBER: P833330
CATALOG NUMBER: TTN-D1-830-U-RW-UPL2

**FLUX DISTRIBUTION:**

| | | Downward | Upward | Total |
|---|---|---|---|---|
| **House Side** | Lumens | 1468.9 | 267.0 | 1735.9 |
| | % Fixture | 42.3 | 7.7 | 50.0 |
| **Street Side** | Lumens | 1468.9 | 267.0 | 1735.9 |
| | % Fixture | 42.3 | 7.7 | 50.0 |
| **Total** | Lumens | 2937.7 | 534.0 | 3471.8 |
| | % Fixture | 84.6 | 15.4 | 100.0 |

**ZONAL LUMENS:**

| Zone | Lumens | % Fixture |
|---|---|---|
| 0°-10° | 24.6 | 0.7 |
| 10°-20° | 78.8 | 2.3 |
| 20°-30° | 164.3 | 4.7 |
| 30°-40° | 294.7 | 8.5 |
| 40°-50° | 470.9 | 13.6 |
| 50°-60° | 644.7 | 18.6 |
| 60°-70° | 665.0 | 19.2 |
| 70°-80° | 472.9 | 13.6 |
| 80°-90° | 121.8 | 3.5 |
| 90°-100° | 11.9 | 0.3 |
| 100°-110° | 121.1 | 3.5 |
| 110°-120° | 177.1 | 5.1 |
| 120°-130° | 102.8 | 3.0 |
| 130°-140° | 54.4 | 1.6 |
| 140°-150° | 32.3 | 0.9 |
| 150°-160° | 19.9 | 0.6 |
| 160°-170° | 10.9 | 0.3 |
| 170°-180° | 3.5 | 0.1 |
| 0°-90° | 2937.7 | 84.6 |
| 0°-180° | 3471.8 | 100.0 |



Cooper Lighting Solutions Photometric Lab
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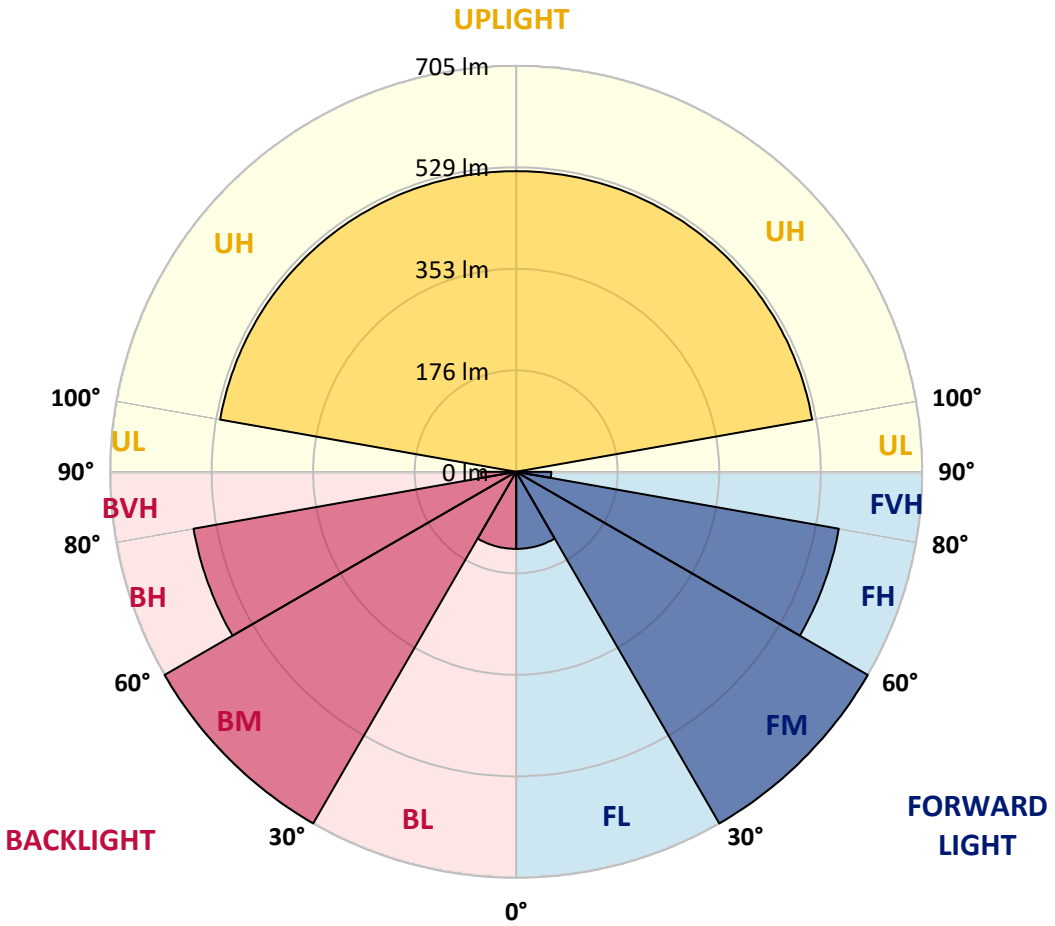
Scaled Data Report

REPORT NUMBER: P833330
CATALOG NUMBER: TTN-D1-830-U-RW-UPL2

## LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:

| Zone | | Lumens | % Fixture | Zone Rating/Lumen Limit B | U | G |
|---|---|---|---|---|---|---|
| FL | (0°-30°) | 133.9 | 3.9 | | | |
| FM | (30°-60°) | 705.2 | 20.3 | | | |
| FH | (60°-80°) | 569.0 | 16.4 | | | G0/660 |
| FVH | (80°-90°) | 60.9 | 1.8 | | | G1/100 |
| BL | (0°-30°) | 133.9 | 3.9 | B1/500 | | |
| BM | (30°-60°) | 705.2 | 20.3 | B1/1000 | | |
| BH | (60°-80°) | 569.0 | 16.4 | B2/1000 | | G2/1000 |
| BVH | (80°-90°) | 60.9 | 1.8 | | | G1/100 |
| UL | (90°-100°) | 11.9 | 0.3 | | U2/50 | |
| UH | (100°-180°) | 522.1 | 15.0 | | U4/1000 | |

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



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Scaled Data Report

REPORT NUMBER: P833330
CATALOG NUMBER: TTN-D1-830-U-RW-UPL2

**CANDELA DISTRIBUTION (FULL):**

| | 0° | 5° | 15° | 25° | 35° | 45° | 55° | 65° | 75° | 85° | 90° |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0° | 262.7 | 262.7 | 262.7 | 262.7 | 262.7 | 262.7 | 262.7 | 262.7 | 262.7 | 262.7 | 262.7 |
| 2.5° | 262.7 | 262.7 | 260.2 | 260.2 | 260.2 | 257.8 | 257.8 | 257.8 | 257.8 | 255.3 | 257.8 |
| 5° | 262.7 | 262.7 | 262.7 | 262.7 | 260.2 | 257.8 | 257.8 | 257.8 | 255.3 | 255.3 | 255.3 |
| 7.5° | 260.2 | 260.2 | 260.2 | 260.2 | 257.8 | 255.3 | 255.3 | 255.3 | 252.8 | 252.8 | 252.8 |
| 10° | 257.8 | 260.2 | 257.8 | 257.8 | 255.3 | 255.3 | 257.8 | 257.8 | 260.2 | 260.2 | 260.2 |
| 12.5° | 255.3 | 255.3 | 255.3 | 257.8 | 257.8 | 260.2 | 265.2 | 270.2 | 272.6 | 275.1 | 275.1 |
| 15° | 255.3 | 255.3 | 257.8 | 260.2 | 265.2 | 270.2 | 277.6 | 285.0 | 290.0 | 294.9 | 294.9 |
| 17.5° | 255.3 | 255.3 | 257.8 | 265.2 | 272.6 | 282.6 | 294.9 | 304.9 | 314.8 | 322.2 | 324.7 |
| 20° | 255.3 | 255.3 | 260.2 | 270.2 | 285.0 | 299.9 | 317.3 | 332.1 | 347.0 | 359.4 | 359.4 |
| 22.5° | 257.8 | 260.2 | 265.2 | 277.6 | 299.9 | 322.2 | 344.5 | 366.8 | 384.2 | 399.0 | 399.0 |
| 25° | 262.7 | 262.7 | 270.2 | 290.0 | 317.3 | 347.0 | 379.2 | 406.5 | 428.8 | 448.6 | 448.6 |
| 27.5° | 265.2 | 267.7 | 277.6 | 302.4 | 337.1 | 374.3 | 418.9 | 451.1 | 480.8 | 498.2 | 500.7 |
| 30° | 270.2 | 272.6 | 287.5 | 312.3 | 354.4 | 401.5 | 453.6 | 498.2 | 530.4 | 547.8 | 552.7 |
| 32.5° | 272.6 | 275.1 | 294.9 | 324.7 | 371.8 | 426.3 | 485.8 | 542.8 | 587.4 | 607.2 | 614.7 |
| 35° | 280.1 | 282.6 | 302.4 | 337.1 | 391.6 | 453.6 | 523.0 | 589.9 | 641.9 | 666.7 | 671.7 |
| 37.5° | 287.5 | 290.0 | 309.8 | 349.5 | 411.4 | 483.3 | 562.6 | 639.5 | 699.0 | 728.7 | 738.6 |
| 40° | 292.5 | 294.9 | 317.3 | 364.3 | 433.7 | 515.5 | 607.2 | 691.5 | 758.4 | 795.6 | 803.0 |
| 42.5° | 299.9 | 302.4 | 327.2 | 376.7 | 453.6 | 547.8 | 654.3 | 748.5 | 820.4 | 862.5 | 872.4 |
| 45° | 307.3 | 309.8 | 337.1 | 391.6 | 475.9 | 582.5 | 701.4 | 815.4 | 897.2 | 946.8 | 956.7 |
| 47.5° | 314.8 | 317.3 | 347.0 | 406.5 | 498.2 | 617.2 | 751.0 | 874.9 | 974.1 | 1021.2 | 1041.0 |
| 50° | 317.3 | 322.2 | 352.0 | 416.4 | 513.1 | 646.9 | 793.1 | 934.4 | 1038.5 | 1100.5 | 1105.4 |
| 52.5° | 319.7 | 324.7 | 356.9 | 423.8 | 525.5 | 669.2 | 827.8 | 984.0 | 1105.4 | 1179.8 | 1174.8 |
| 55° | 322.2 | 322.2 | 356.9 | 423.8 | 530.4 | 684.1 | 852.6 | 1016.2 | 1150.0 | 1209.5 | 1244.2 |
| 57.5° | 312.3 | 314.8 | 352.0 | 418.9 | 527.9 | 681.6 | 852.6 | 1028.6 | 1167.4 | 1231.8 | 1256.6 |
| 60° | 299.9 | 304.9 | 339.6 | 406.5 | 518.0 | 674.2 | 847.7 | 1023.6 | 1174.8 | 1244.2 | 1236.8 |
| 62.5° | 282.6 | 292.5 | 322.2 | 389.1 | 503.1 | 656.8 | 840.2 | 1011.2 | 1157.5 | 1229.4 | 1221.9 |
| 65° | 262.7 | 272.6 | 299.9 | 371.8 | 470.9 | 614.7 | 800.6 | 986.5 | 1110.4 | 1192.2 | 1177.3 |
| 67.5° | 242.9 | 250.3 | 277.6 | 342.0 | 433.7 | 570.1 | 748.5 | 931.9 | 1043.5 | 1132.7 | 1125.3 |
| 70° | 220.6 | 223.1 | 250.3 | 307.3 | 396.6 | 525.5 | 699.0 | 855.1 | 984.0 | 1050.9 | 1065.8 |
| 72.5° | 193.3 | 193.3 | 220.6 | 270.2 | 352.0 | 466.0 | 632.0 | 768.4 | 889.8 | 946.8 | 969.1 |
| 75° | 158.6 | 161.1 | 183.4 | 228.0 | 294.9 | 399.0 | 537.8 | 676.6 | 778.3 | 837.7 | 845.2 |
| 77.5° | 123.9 | 126.4 | 143.8 | 180.9 | 237.9 | 322.2 | 443.7 | 552.7 | 649.4 | 701.4 | 686.6 |
| 80° | 89.2 | 91.7 | 104.1 | 131.4 | 176.0 | 240.4 | 342.0 | 438.7 | 508.1 | 550.2 | 530.4 |
| 82.5° | 54.5 | 57.0 | 64.4 | 81.8 | 111.5 | 156.1 | 233.0 | 304.9 | 359.4 | 394.1 | 386.7 |
| 85° | 27.3 | 27.3 | 32.2 | 37.2 | 47.1 | 69.4 | 111.5 | 153.7 | 195.8 | 220.6 | 213.2 |
| 87.5° | 5.0 | 7.4 | 7.4 | 7.4 | 7.4 | 5.0 | 7.4 | 7.4 | 7.4 | 12.4 | 5.0 |
| 90° | 4.6 | 4.6 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 4.6 | 4.6 |
| 92.5° | 4.6 | 4.6 | 4.6 | 6.4 | 7.3 | 6.4 | 7.3 | 5.5 | 5.5 | 4.6 | 4.6 |
| 95° | 5.5 | 5.5 | 6.4 | 8.2 | 10.1 | 11.0 | 11.0 | 6.4 | 6.4 | 5.5 | 5.5 |
| 97.5° | 7.3 | 8.2 | 8.2 | 10.1 | 16.4 | 30.2 | 18.3 | 9.1 | 9.1 | 8.2 | 7.3 |
| 100° | 11.9 | 12.8 | 12.8 | 22.8 | 48.4 | 64.9 | 46.6 | 23.8 | 17.4 | 12.8 | 12.8 |
| 102.5° | 38.4 | 40.2 | 49.3 | 74.0 | 109.6 | 99.6 | 84.1 | 79.5 | 54.8 | 43.9 | 42.0 |
| 105° | 97.8 | 96.8 | 104.2 | 123.3 | 153.5 | 150.8 | 138.9 | 126.1 | 108.7 | 100.5 | 100.5 |
| 107.5° | 128.8 | 128.8 | 135.2 | 151.7 | 174.5 | 203.7 | 206.5 | 163.5 | 143.4 | 134.3 | 133.4 |
| 110° | 145.3 | 145.3 | 150.8 | 164.5 | 194.6 | 235.7 | 233.9 | 201.9 | 177.3 | 165.4 | 163.5 |

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

Scaled Data Report

REPORT NUMBER: P833330
CATALOG NUMBER: TTN-D1-830-U-RW-UPL2

**CANDELA DISTRIBUTION (continued):**

| | 0° | 5° | 15° | 25° | 35° | 45° | 55° | 65° | 75° | 85° | 90° |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 112.5° | 148.9 | 149.8 | 157.1 | 178.2 | 211.1 | 229.3 | 221.1 | 208.3 | 197.4 | 188.2 | *186.4* |
| 115° | 154.4 | 154.4 | 162.6 | 182.7 | 201.0 | 208.3 | 199.2 | 189.1 | 181.8 | 178.2 | *180.0* |
| 117.5° | 152.6 | 155.3 | 157.1 | 168.1 | 180.0 | 185.5 | 180.9 | 167.2 | 161.7 | 159.9 | *157.1* |
| 120° | 141.6 | 141.6 | 143.4 | 148.9 | 155.3 | 158.1 | 156.2 | 147.1 | 142.5 | 141.6 | *139.8* |
| 122.5° | 126.1 | 127.0 | 126.1 | 128.8 | 133.4 | 136.1 | 134.3 | 127.0 | 125.2 | 125.2 | *123.3* |
| 125° | 110.6 | 110.6 | 109.6 | 111.5 | 114.2 | 113.3 | 114.2 | 110.6 | 109.6 | 109.6 | *108.7* |
| 127.5° | 99.6 | 98.7 | 96.8 | 97.8 | 98.7 | 98.7 | 99.6 | 95.9 | 96.8 | 97.8 | *96.8* |
| 130° | 88.6 | 88.6 | 86.8 | 86.8 | 86.8 | 85.0 | 86.8 | 85.0 | 85.9 | 86.8 | *87.7* |
| 132.5° | 78.6 | 78.6 | 75.8 | 74.9 | 74.9 | 74.9 | 75.8 | 74.9 | 76.7 | 78.6 | *78.6* |
| 135° | 70.4 | 70.4 | 67.6 | 68.5 | 68.5 | 67.6 | 68.5 | 67.6 | 69.4 | 70.4 | *70.4* |
| 137.5° | 64.0 | 64.0 | 62.1 | 62.1 | 62.1 | 61.2 | 62.1 | 62.1 | 63.0 | 64.9 | *65.8* |
| 140° | 58.5 | 58.5 | 57.6 | 57.6 | 56.6 | 57.6 | 57.6 | 57.6 | 58.5 | 59.4 | *59.4* |
| 142.5° | 55.7 | 54.8 | 53.9 | 53.0 | 53.9 | 53.9 | 53.9 | 53.0 | 53.9 | 55.7 | *55.7* |
| 145° | 51.2 | 51.2 | 50.3 | 50.3 | 50.3 | 51.2 | 50.3 | 50.3 | 51.2 | 51.2 | *52.1* |
| 147.5° | 48.4 | 48.4 | 47.5 | 48.4 | 48.4 | 48.4 | 48.4 | 47.5 | 48.4 | 48.4 | *49.3* |
| 150° | 47.5 | 46.6 | 45.7 | 46.6 | 46.6 | 45.7 | 45.7 | 45.7 | 45.7 | 46.6 | *46.6* |
| 152.5° | 44.8 | 44.8 | 43.9 | 44.8 | 43.9 | 43.9 | 43.9 | 43.9 | 43.9 | 44.8 | *45.7* |
| 155° | 42.9 | 42.9 | 42.0 | 42.9 | 42.9 | 42.9 | 42.9 | 42.9 | 42.9 | 42.9 | *42.9* |
| 157.5° | 41.1 | 42.0 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 41.1 | 42.0 | *42.0* |
| 160° | 40.2 | 40.2 | 40.2 | 40.2 | 39.3 | 39.3 | 39.3 | 40.2 | 40.2 | 40.2 | *41.1* |
| 162.5° | 39.3 | 39.3 | 39.3 | 39.3 | 38.4 | 38.4 | 38.4 | 38.4 | 39.3 | 39.3 | *40.2* |
| 165° | 39.3 | 38.4 | 38.4 | 38.4 | 37.5 | 37.5 | 37.5 | 37.5 | 38.4 | 39.3 | *38.4* |
| 167.5° | 37.5 | 37.5 | 37.5 | 37.5 | 37.5 | 36.5 | 36.5 | 37.5 | 37.5 | 37.5 | *38.4* |
| 170° | 37.5 | 37.5 | 36.5 | 36.5 | 36.5 | 36.5 | 36.5 | 36.5 | 36.5 | 36.5 | *37.5* |
| 172.5° | 37.5 | 37.5 | 37.5 | 37.5 | 36.5 | 36.5 | 36.5 | 36.5 | 36.5 | 37.5 | *37.5* |
| 175° | 37.5 | 37.5 | 37.5 | 37.5 | 36.5 | 36.5 | 36.5 | 37.5 | 37.5 | 37.5 | *36.5* |
| 177.5° | 37.5 | 37.5 | 37.5 | 37.5 | 36.5 | 37.5 | 37.5 | 37.5 | 37.5 | 37.5 | *37.5* |
| 180° | 37.5 | 37.5 | 37.5 | 37.5 | 37.5 | 37.5 | 37.5 | 37.5 | 37.5 | 37.5 | *37.5* |

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

MCGRAW EDISON

Report Number: SP1-2411-284-4

Test Date: 11/22/2024

Luminaire Tested: TTN-D0-830-U-WQ

Data in this report applies to TT and TTN families of products

Report Generated By FNC07603 / LDUCLS01DT446
Version: v7.04

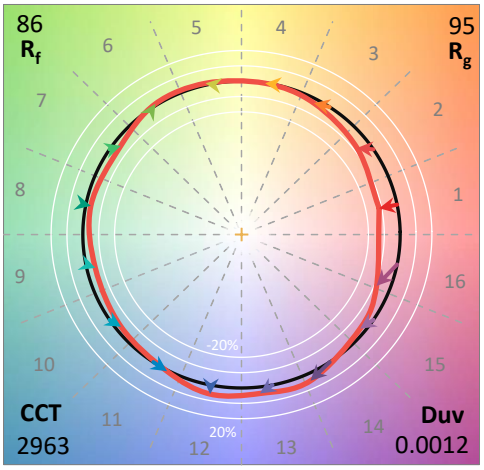
## Test Information

| | |
|---|---|
| Test Method: | LM-79-2019 |
| Report Number: | SP1-2411-284-4 |
| Test Lab: | COOPER LIGHTING SOLUTIONS |
| Photometer: | SP1 - 76IN SPHERE |
| Measurement Geometry: | 4π |
| Issue Date: | 11/22/2024 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS |
| Product Line: | MCGRAW EDISON |
| Catalog Number: | **TTN-D0-830-U-WQ** |
| Description: | TOPTIER NANO LED PARKING GARAGE LUMINAIRE. 3000K, 80 CRI LEDS AND WIDE DISTRIBUTION |

## Spectral Parameters

| | |
|---|---|
| CCT (K): | 2963 |
| CIE u': | 0.2515 |
| CIE v': | 0.5238 |
| Duv: | 0.0012 |
| CIE x: | 0.4414 |
| CIE y: | 0.4086 |
| CIE z: | 0.1501 |
| Peak Wavelength (nm): | 603 |
| Dominant Wavelength (nm): | 582 |
| Purity: | 55.12798 |
| Rf: | 86.1 |
| Rg: | 94.9 |

| | |
|---|---|
| CRI (Ra): | 82.9 |
| R1: | 81.4 |
| R2: | 91.9 |
| R3: | 95.2 |
| R4: | 81.6 |
| R5: | 82.3 |
| R6: | 91.4 |
| R7: | 82.0 |
| R8: | 57.2 |
| R9: | 3.9 |
| R10: | 82.5 |
| R11: | 82.3 |
| R12: | 76.5 |
| R13: | 83.9 |
| R14: | 97.8 |
| R15: | 72.6 |



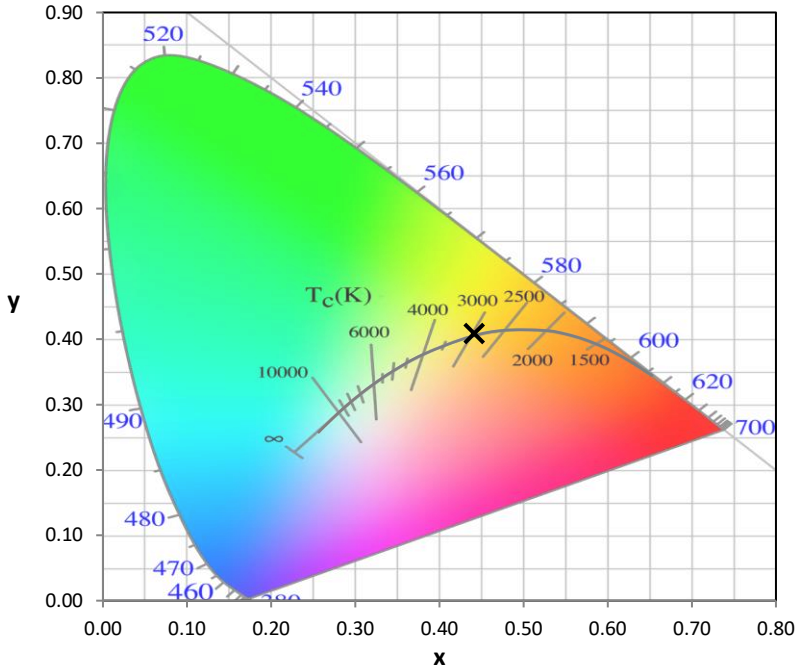

## Test Conditions

| | |
|---|---|
| Stabilization Time: | 37M |
| Operation Time: | 1H 37M |
| Sphere Temperature (°C): | 25.0 |

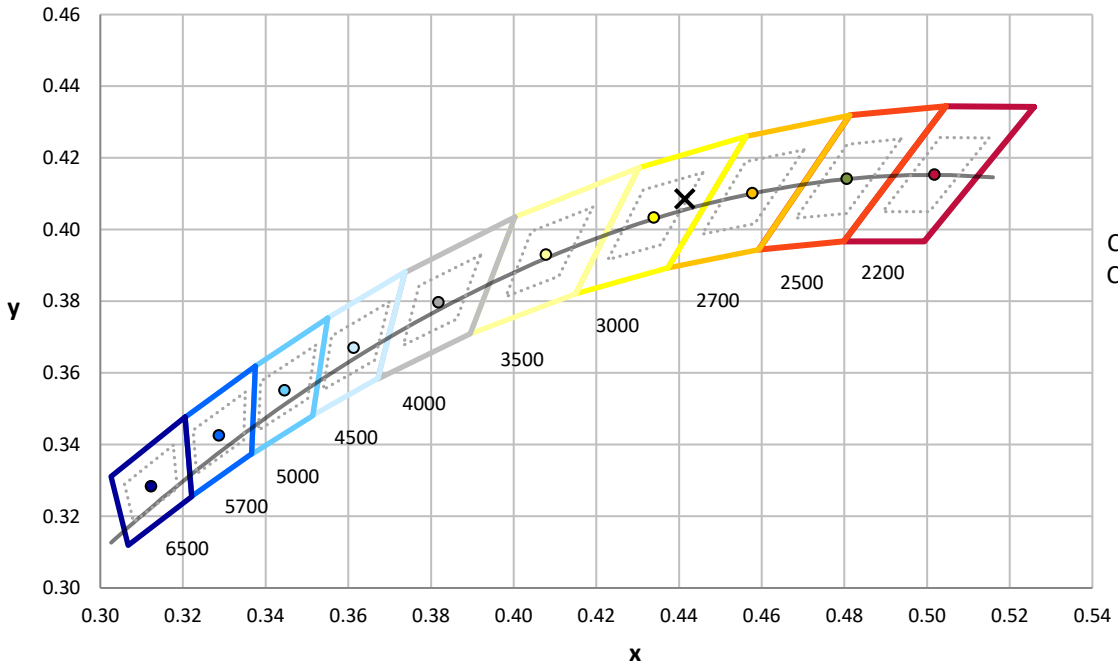
| Measurement and Test Equipment | | | |
|---|---|---|---|
| Instrument | Identification Number | Calibration Date | Calibration Due Date |
| Photometer | IN0058 | 6/18/2024 | 12/18/2024 |
| Power Meter | INXT2011004 | 2/8/2024 | 2/8/2025 |
| AC Power Source | IN0063 | 10/22/2024 | 10/22/2025 |
| DC Power Source | IN0208 | 10/22/2024 | 10/22/2025 |
| Sphere Thermometer | IN0085 | 10/22/2024 | 10/22/2025 |
| Room Thermometer | IN0046 | 10/22/2024 | 10/22/2025 |

REPORT NUMBER: SP1-2411-284-4

## CIE 1931 Chromaticity Diagram




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

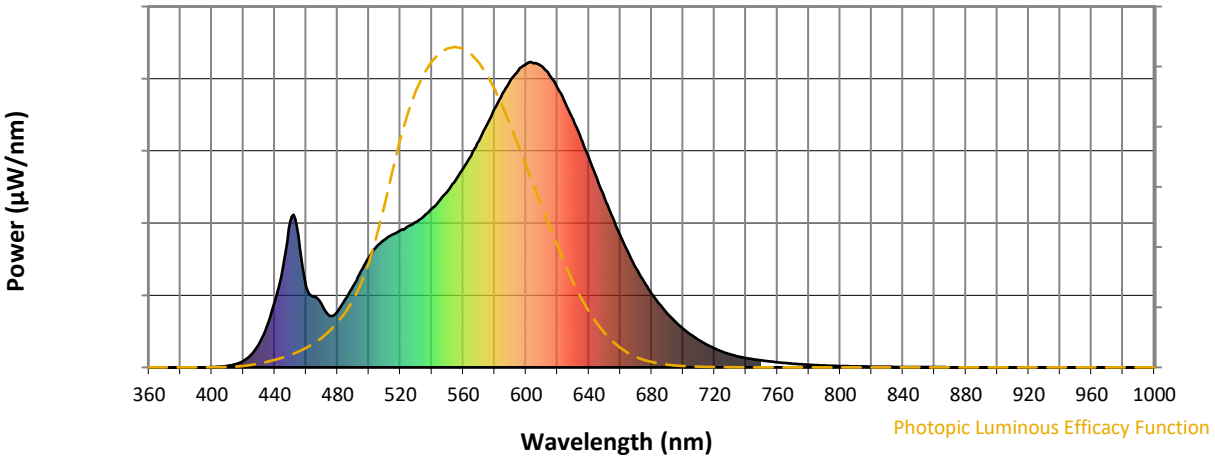



CCT = 2963K
CIE x = 0.4414
CIE y = 0.4086
Duv = 0.0012

Point lies inside the ANSI 3000K 4-step quadrangle

REPORT NUMBER: SP1-2411-284-4

## 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 | 267 | NR | 620 | 915 | NR | 750 | 23 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 315 | NR | 625 | 866 | NR | 755 | 20 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 360 | NR | 630 | 811 | NR | 760 | 17 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 396 | NR | 635 | 750 | NR | 765 | 14 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 418 | NR | 640 | 686 | NR | 770 | 12 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 435 | NR | 645 | 619 | NR | 775 | 10 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 448 | NR | 650 | 554 | NR | 780 | 9 | NR | 910 | 0 | NR |
| 395 | 0 | NR | 525 | 462 | NR | 655 | 491 | NR | 785 | 7 | NR | 915 | 0 | NR |
| 400 | 1 | NR | 530 | 476 | NR | 660 | 431 | NR | 790 | 6 | NR | 920 | 0 | NR |
| 405 | 2 | NR | 535 | 495 | NR | 665 | 376 | NR | 795 | 5 | NR | 925 | 0 | NR |
| 410 | 5 | NR | 540 | 520 | NR | 670 | 325 | NR | 800 | 4 | NR | 930 | 0 | NR |
| 415 | 10 | NR | 545 | 547 | NR | 675 | 280 | NR | 805 | 4 | NR | 935 | 0 | NR |
| 420 | 21 | NR | 550 | 576 | NR | 680 | 241 | NR | 810 | 3 | NR | 940 | 0 | NR |
| 425 | 42 | NR | 555 | 612 | NR | 685 | 207 | NR | 815 | 3 | NR | 945 | 0 | NR |
| 430 | 77 | NR | 560 | 651 | NR | 690 | 176 | NR | 820 | 2 | NR | 950 | 0 | NR |
| 435 | 135 | NR | 565 | 693 | NR | 695 | 149 | NR | 825 | 2 | NR | 955 | 0 | NR |
| 440 | 215 | NR | 570 | 741 | NR | 700 | 127 | NR | 830 | 2 | NR | 960 | 0 | NR |
| 445 | 321 | NR | 575 | 793 | NR | 705 | 107 | NR | 835 | 2 | NR | 965 | 0 | NR |
| 450 | 479 | NR | 580 | 847 | NR | 710 | 89 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 432 | NR | 585 | 897 | NR | 715 | 75 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 265 | NR | 590 | 940 | NR | 720 | 62 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 231 | NR | 595 | 971 | NR | 725 | 51 | NR | 855 | 1 | NR | 985 | 0 | NR |
| 470 | 204 | NR | 600 | 993 | NR | 730 | 43 | NR | 860 | 1 | NR | 990 | 0 | NR |
| 475 | 168 | NR | 605 | 996 | NR | 735 | 36 | NR | 865 | 1 | NR | 995 | 0 | NR |
| 480 | 183 | NR | 610 | 986 | NR | 740 | 31 | NR | 870 | 1 | NR | 1000 | 0 | NR |
| 485 | 223 | NR | 615 | 957 | NR | 745 | 26 | NR | 875 | 0 | NR | | | |

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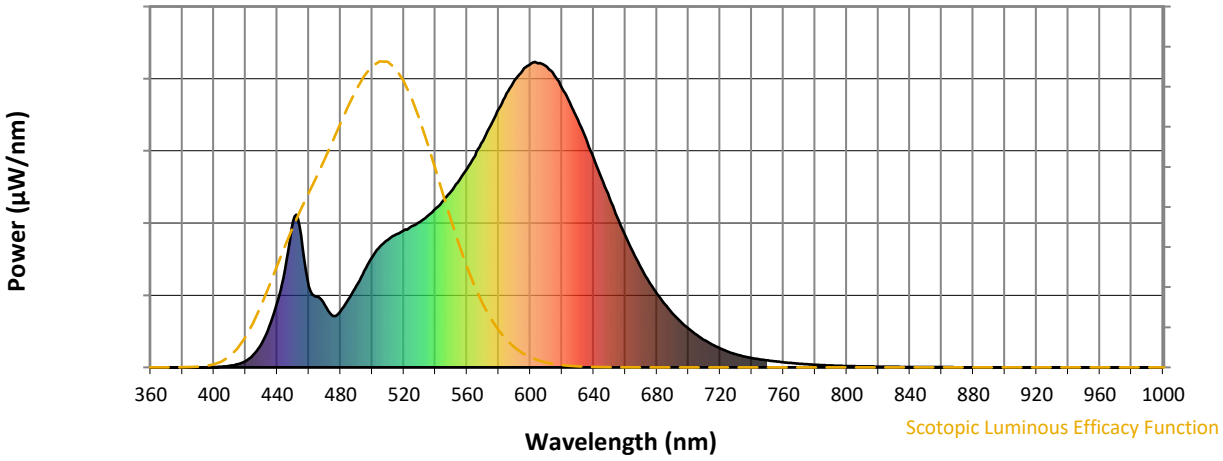
## Scotopic Flux vs. Wavelength




**Scotopic Lumens: NR** **S/P: 1.34**

| 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 | 267 | NR | 620 | 915 | NR | 750 | 23 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 315 | NR | 625 | 866 | NR | 755 | 20 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 360 | NR | 630 | 811 | NR | 760 | 17 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 396 | NR | 635 | 750 | NR | 765 | 14 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 418 | NR | 640 | 686 | NR | 770 | 12 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 435 | NR | 645 | 619 | NR | 775 | 10 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 448 | NR | 650 | 554 | NR | 780 | 9 | NR | 910 | 0 | NR |
| 395 | 0 | NR | 525 | 462 | NR | 655 | 491 | NR | 785 | 7 | NR | 915 | 0 | NR |
| 400 | 1 | NR | 530 | 476 | NR | 660 | 431 | NR | 790 | 6 | NR | 920 | 0 | NR |
| 405 | 2 | NR | 535 | 495 | NR | 665 | 376 | NR | 795 | 5 | NR | 925 | 0 | NR |
| 410 | 5 | NR | 540 | 520 | NR | 670 | 325 | NR | 800 | 4 | NR | 930 | 0 | NR |
| 415 | 10 | NR | 545 | 547 | NR | 675 | 280 | NR | 805 | 4 | NR | 935 | 0 | NR |
| 420 | 21 | NR | 550 | 576 | NR | 680 | 241 | NR | 810 | 3 | NR | 940 | 0 | NR |
| 425 | 42 | NR | 555 | 612 | NR | 685 | 207 | NR | 815 | 3 | NR | 945 | 0 | NR |
| 430 | 77 | NR | 560 | 651 | NR | 690 | 176 | NR | 820 | 2 | NR | 950 | 0 | NR |
| 435 | 135 | NR | 565 | 693 | NR | 695 | 149 | NR | 825 | 2 | NR | 955 | 0 | NR |
| 440 | 215 | NR | 570 | 741 | NR | 700 | 127 | NR | 830 | 2 | NR | 960 | 0 | NR |
| 445 | 321 | NR | 575 | 793 | NR | 705 | 107 | NR | 835 | 2 | NR | 965 | 0 | NR |
| 450 | 479 | NR | 580 | 847 | NR | 710 | 89 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 432 | NR | 585 | 897 | NR | 715 | 75 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 265 | NR | 590 | 940 | NR | 720 | 62 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 231 | NR | 595 | 971 | NR | 725 | 51 | NR | 855 | 1 | NR | 985 | 0 | NR |
| 470 | 204 | NR | 600 | 993 | NR | 730 | 43 | NR | 860 | 1 | NR | 990 | 0 | NR |
| 475 | 168 | NR | 605 | 996 | NR | 735 | 36 | NR | 865 | 1 | NR | 995 | 0 | NR |
| 480 | 183 | NR | 610 | 986 | NR | 740 | 31 | NR | 870 | 1 | NR | 1000 | 0 | NR |
| 485 | 223 | NR | 615 | 957 | NR | 745 | 26 | NR | 875 | 0 | NR | | | |

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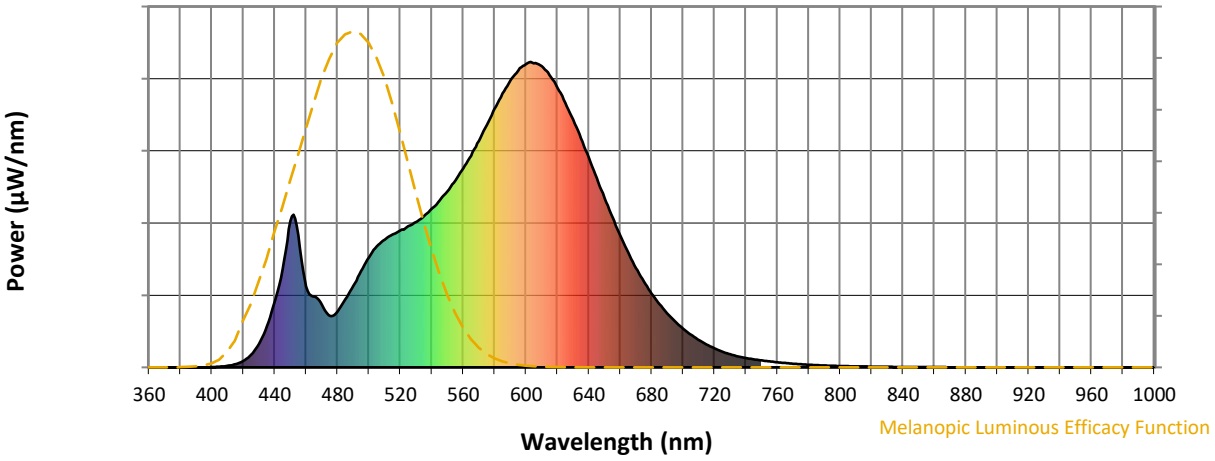
## Melanopic Flux vs. Wavelength




**Melanopic Lumens: NR** **M/P: 2.58**

| 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 | 267 | NR | 620 | 915 | NR | 750 | 23 | NR | 880 | 0 | NR |
| 365 | 0 | NR | 495 | 315 | NR | 625 | 866 | NR | 755 | 20 | NR | 885 | 0 | NR |
| 370 | 0 | NR | 500 | 360 | NR | 630 | 811 | NR | 760 | 17 | NR | 890 | 0 | NR |
| 375 | 0 | NR | 505 | 396 | NR | 635 | 750 | NR | 765 | 14 | NR | 895 | 0 | NR |
| 380 | 0 | NR | 510 | 418 | NR | 640 | 686 | NR | 770 | 12 | NR | 900 | 0 | NR |
| 385 | 0 | NR | 515 | 435 | NR | 645 | 619 | NR | 775 | 10 | NR | 905 | 0 | NR |
| 390 | 0 | NR | 520 | 448 | NR | 650 | 554 | NR | 780 | 9 | NR | 910 | 0 | NR |
| 395 | 0 | NR | 525 | 462 | NR | 655 | 491 | NR | 785 | 7 | NR | 915 | 0 | NR |
| 400 | 1 | NR | 530 | 476 | NR | 660 | 431 | NR | 790 | 6 | NR | 920 | 0 | NR |
| 405 | 2 | NR | 535 | 495 | NR | 665 | 376 | NR | 795 | 5 | NR | 925 | 0 | NR |
| 410 | 5 | NR | 540 | 520 | NR | 670 | 325 | NR | 800 | 4 | NR | 930 | 0 | NR |
| 415 | 10 | NR | 545 | 547 | NR | 675 | 280 | NR | 805 | 4 | NR | 935 | 0 | NR |
| 420 | 21 | NR | 550 | 576 | NR | 680 | 241 | NR | 810 | 3 | NR | 940 | 0 | NR |
| 425 | 42 | NR | 555 | 612 | NR | 685 | 207 | NR | 815 | 3 | NR | 945 | 0 | NR |
| 430 | 77 | NR | 560 | 651 | NR | 690 | 176 | NR | 820 | 2 | NR | 950 | 0 | NR |
| 435 | 135 | NR | 565 | 693 | NR | 695 | 149 | NR | 825 | 2 | NR | 955 | 0 | NR |
| 440 | 215 | NR | 570 | 741 | NR | 700 | 127 | NR | 830 | 2 | NR | 960 | 0 | NR |
| 445 | 321 | NR | 575 | 793 | NR | 705 | 107 | NR | 835 | 2 | NR | 965 | 0 | NR |
| 450 | 479 | NR | 580 | 847 | NR | 710 | 89 | NR | 840 | 1 | NR | 970 | 0 | NR |
| 455 | 432 | NR | 585 | 897 | NR | 715 | 75 | NR | 845 | 1 | NR | 975 | 0 | NR |
| 460 | 265 | NR | 590 | 940 | NR | 720 | 62 | NR | 850 | 1 | NR | 980 | 0 | NR |
| 465 | 231 | NR | 595 | 971 | NR | 725 | 51 | NR | 855 | 1 | NR | 985 | 0 | NR |
| 470 | 204 | NR | 600 | 993 | NR | 730 | 43 | NR | 860 | 1 | NR | 990 | 0 | NR |
| 475 | 168 | NR | 605 | 996 | NR | 735 | 36 | NR | 865 | 1 | NR | 995 | 0 | NR |
| 480 | 183 | NR | 610 | 986 | NR | 740 | 31 | NR | 870 | 1 | NR | 1000 | 0 | NR |
| 485 | 223 | NR | 615 | 957 | NR | 745 | 26 | NR | 875 | 0 | NR | | | |

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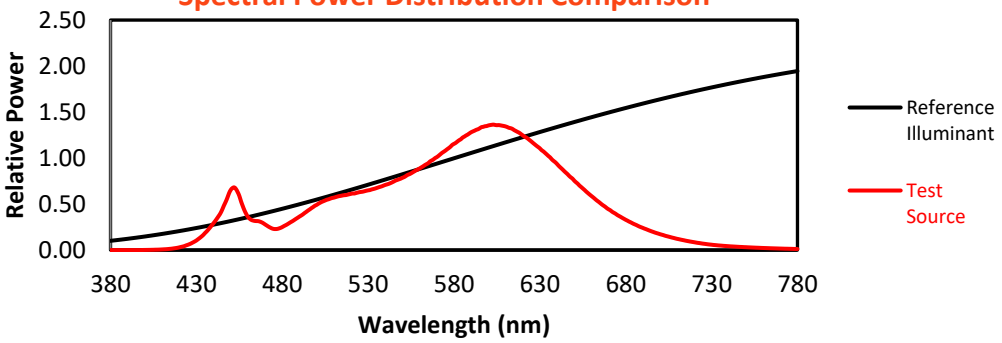
# TM-30-18

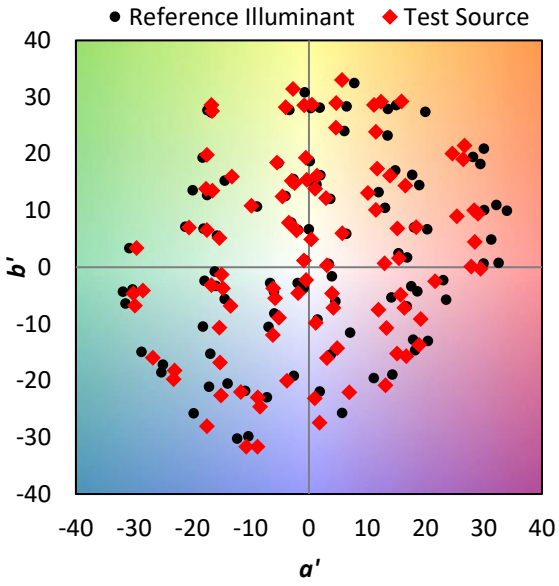
## Summary

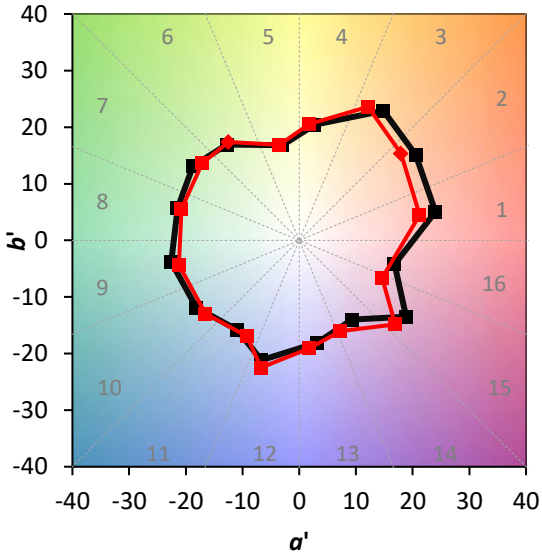
$R_f$ = 86.1
$R_g$ = 94.9
CIE $R_a$ = 82.9
$R_9$ = 3.9

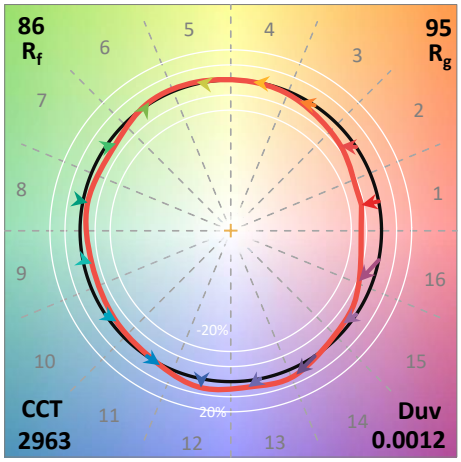
## Spectral Power Distribution Comparison

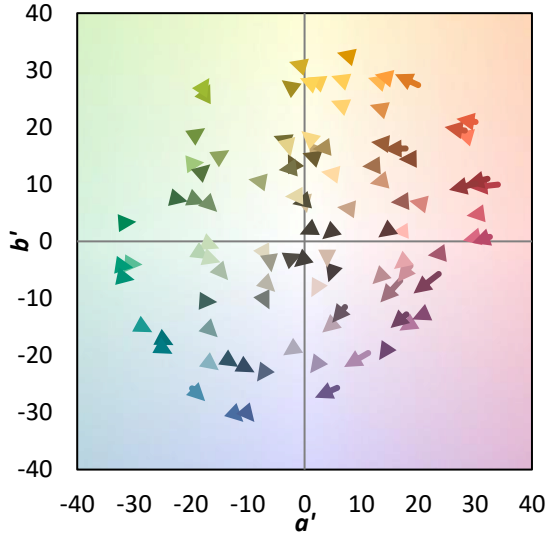



## Color Vector Graphics



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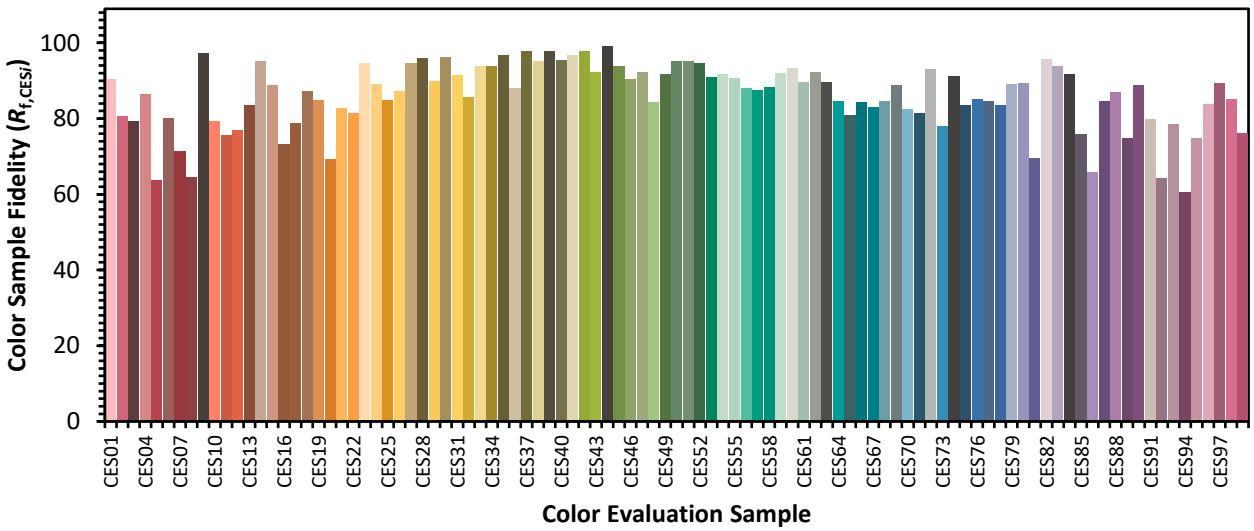
# TM-30-18

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

| | | | |
|---|---|---|---|
| CES01 = 86 | CES26 = 87 | CES51 = 95 | CES76 = 85 |
| CES02 = 63 | CES27 = 95 | CES52 = 95 | CES77 = 85 |
| CES03 = 31 | CES28 = 96 | CES53 = 91 | CES78 = 83 |
| CES04 = 70 | CES29 = 90 | CES54 = 92 | CES79 = 89 |
| CES05 = 50 | CES30 = 96 | CES55 = 91 | CES80 = 89 |
| CES06 = 51 | CES31 = 92 | CES56 = 88 | CES81 = 70 |
| CES07 = 42 | CES32 = 86 | CES57 = 87 | CES82 = 96 |
| CES08 = 41 | CES33 = 94 | CES58 = 88 | CES83 = 94 |
| CES09 = 29 | CES34 = 94 | CES59 = 92 | CES84 = 92 |
| CES10 = 76 | CES35 = 97 | CES60 = 93 | CES85 = 76 |
| CES11 = 59 | CES36 = 88 | CES61 = 90 | CES86 = 66 |
| CES12 = 65 | CES37 = 98 | CES62 = 92 | CES87 = 85 |
| CES13 = 44 | CES38 = 95 | CES63 = 90 | CES88 = 87 |
| CES14 = 74 | CES39 = 98 | CES64 = 85 | CES89 = 75 |
| CES15 = 72 | CES40 = 96 | CES65 = 81 | CES90 = 89 |
| CES16 = 48 | CES41 = 97 | CES66 = 84 | CES91 = 80 |
| CES17 = 50 | CES42 = 98 | CES67 = 83 | CES92 = 64 |
| CES18 = 57 | CES43 = 92 | CES68 = 85 | CES93 = 79 |
| CES19 = 72 | CES44 = 99 | CES69 = 89 | CES94 = 61 |
| CES20 = 67 | CES45 = 94 | CES70 = 83 | CES95 = 75 |
| CES21 = 87 | CES46 = 91 | CES71 = 81 | CES96 = 84 |
| CES22 = 79 | CES47 = 92 | CES72 = 93 | CES97 = 89 |
| CES23 = 92 | CES48 = 84 | CES73 = 78 | CES98 = 85 |
| CES24 = 91 | CES49 = 92 | CES74 = 91 | CES99 = 76 |
| CES25 = 72 | CES50 = 95 | CES75 = 84 | |



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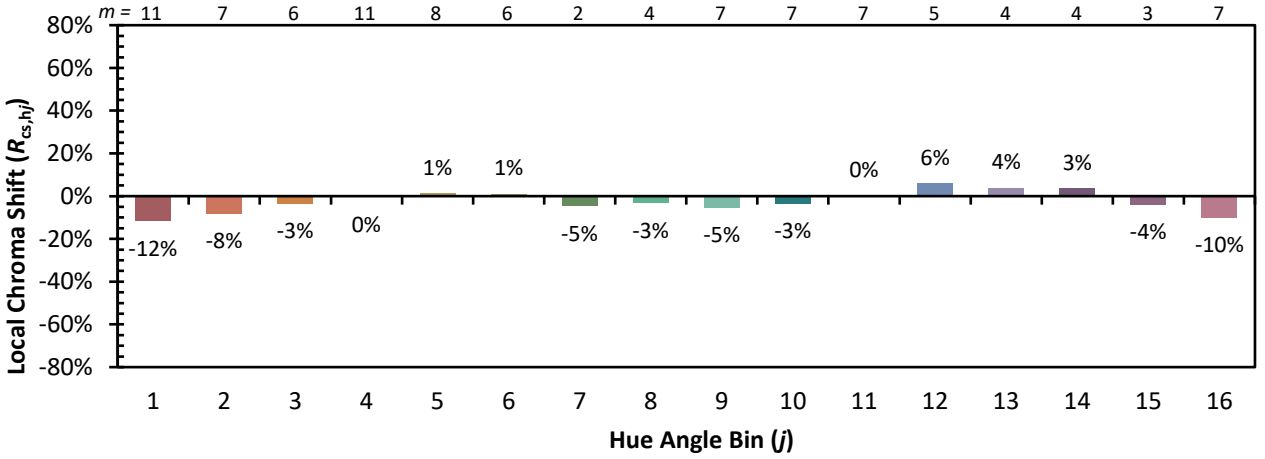
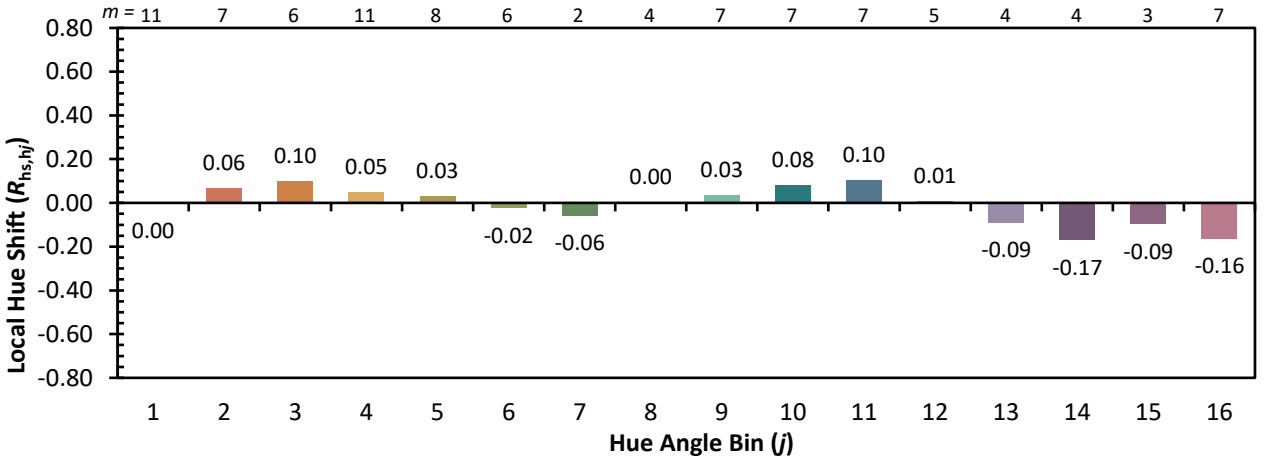
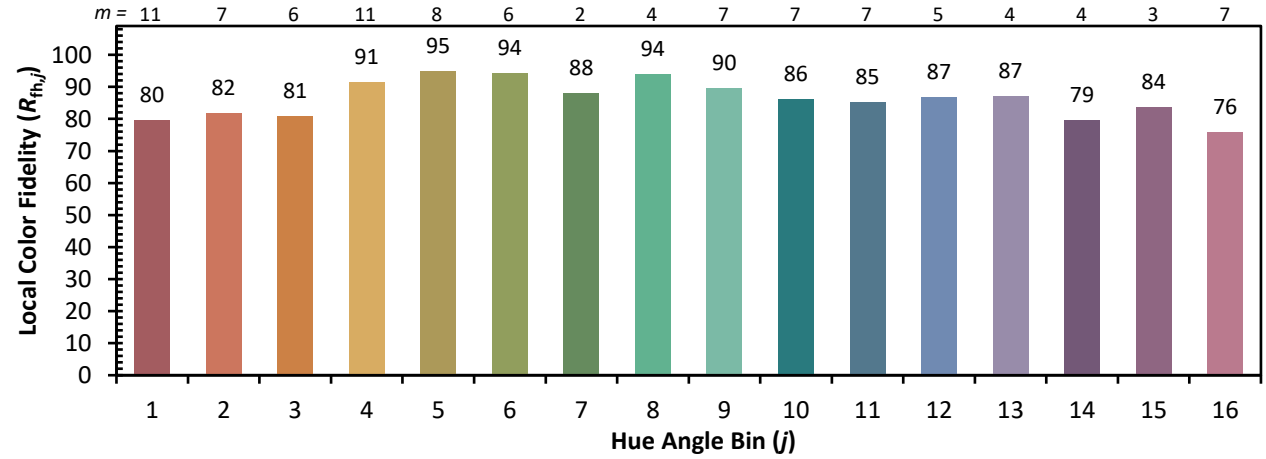
**TM-30-18**

## Color Rendition by Hue-Angle Bin



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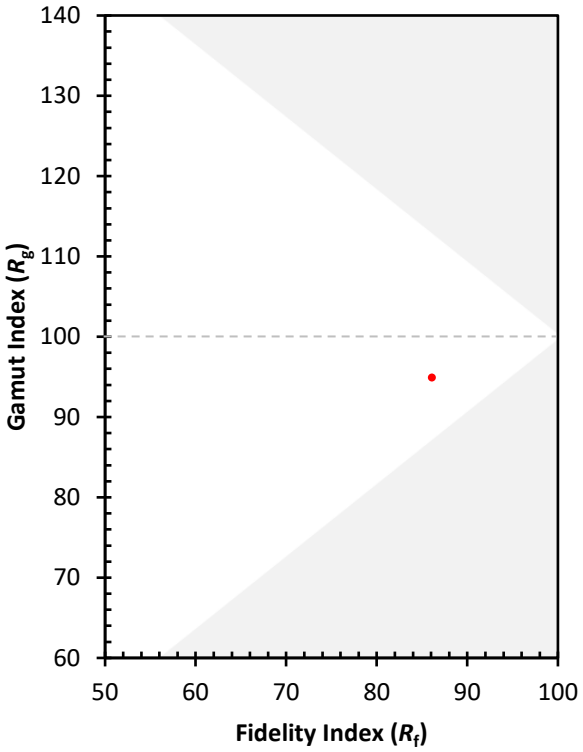
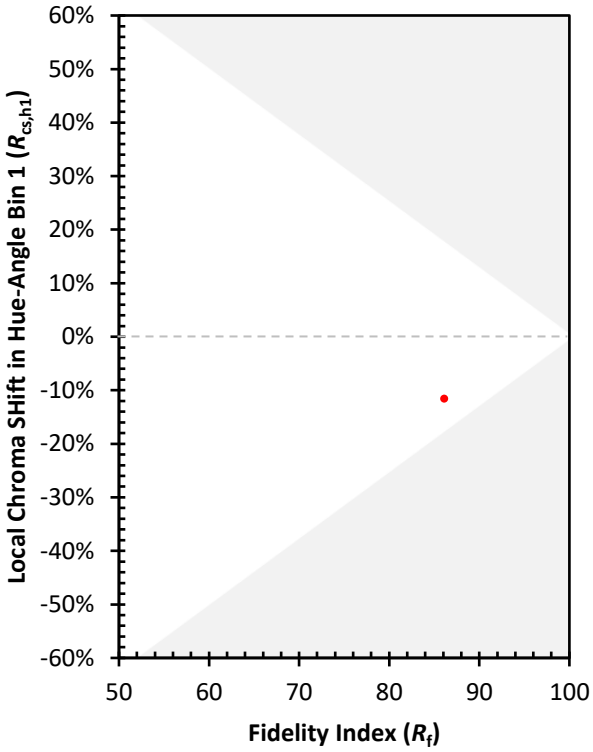
# TM-30-18

## Measure Comparisons




(END OF REPORT)