Classified

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: io LED

Report Number: P895859

Luminaire Tested: **GRZ-15L-935-30x60-X-UNV-STD-1F**

Issue Date: 11/20/2024

Report Generated By 670245763 / DESKTOP-DVLU35A

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: | P895859 |
| Test Lab: | INNOVATION CENTER(G3) |
| Issue Date: | 11/20/2024 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS (FORMERLY EATON) |
| Product Line: | io LED |
| Catalog Number: | GRZ-15L-935-30x60-X-UNV-STD-1F |
| Description: | iO LED 90CRI 3500K GRAZER 1500 lumens per ft WITH 30 deg x 60 deg OPTIC |
| Light Source: | 3500K CCT, 90 CRI LEDS |
| Ballast/Driver: | ELECTRONIC DRIVER |

**Summary**

| | |
|---|---|
| Lumens per Lamp: | N/A |
| Luminaire Lumens: | 1153.6 lumens |
| Efficiency: | N/A |
| Efficacy: | 77.4 lumens/watt |
| Spacing Criteria (0/90/45): | 0.53 / 1.01 / 0.76 |
| Luminous Opening: | Rectangular (W 1' x L: 0.17' x H: 0') |
| CIE Type: | Direct |

| | |
|---|---|
| Input Watts (W): | 14.9 |
| 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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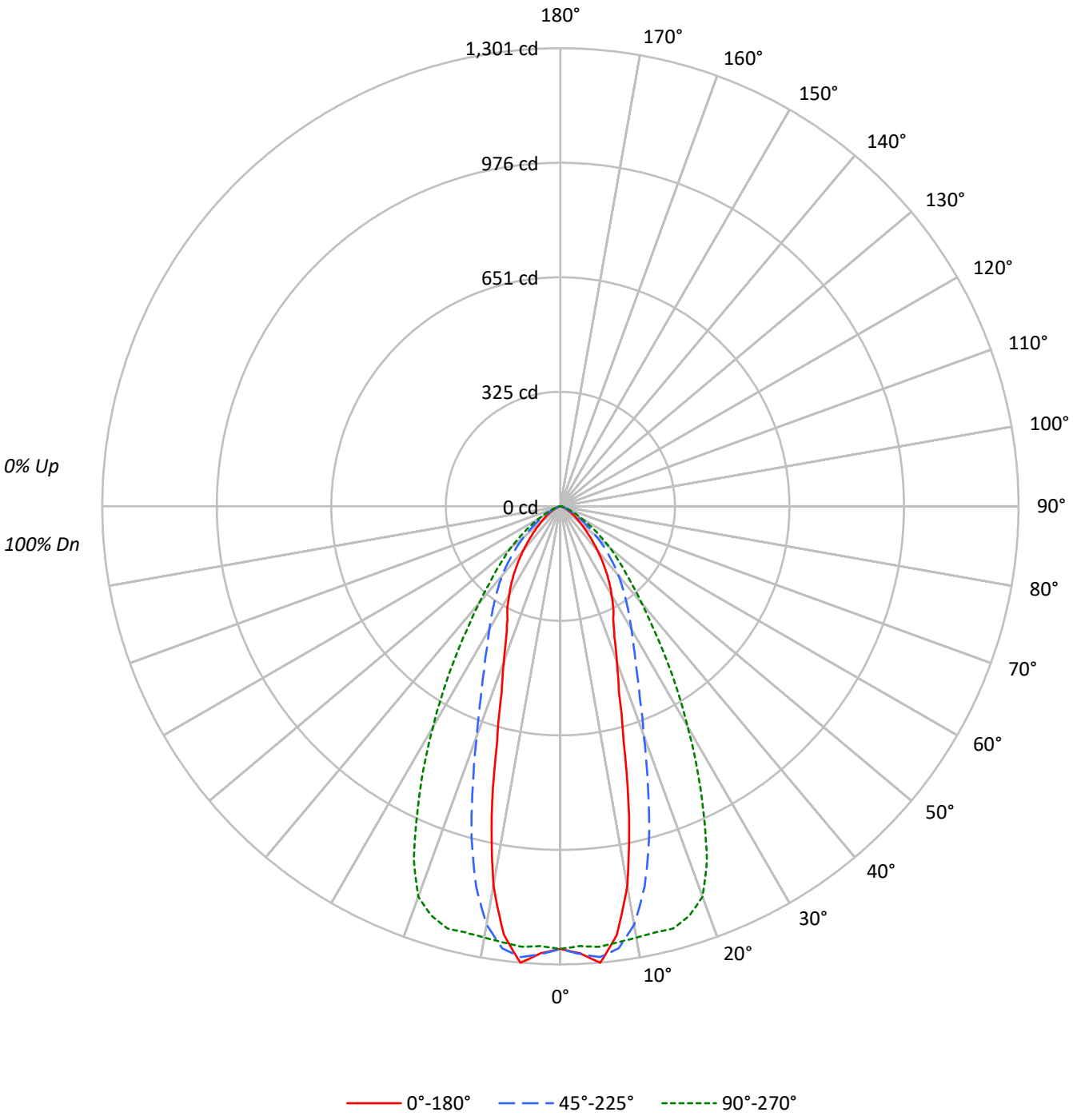
TEST NUMBER: P895859
CATALOG NUMBER: GRZ-15L-935-30x60-X-UNV-STD-1F

## Luminous Intensity Polar Plot



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Scaled Data Report

TEST NUMBER: P895859
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## COEFFICIENT OF UTILIZATION - ZONAL CAVITY METHOD:

| RF | 20 | | | | 20 | | | | 20 | | | 20 | | | 20 | | | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RC | 80 | | | | 70 | | | | 50 | | | 30 | | | 10 | | | 0 |
| RW | 70 | 50 | 30 | 10 | 70 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 0 |
| RCR | | | | | | | | | | | | | | | | | | |
| 0 | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 | 106 | 106 | 106 | 102 | 102 | 102 | 100 |
| 1 | 113 | 109 | 107 | 104 | 110 | 107 | 105 | 102 | 103 | 101 | 99 | 99 | 98 | 96 | 96 | 95 | 94 | 92 |
| 2 | 106 | 100 | 96 | 92 | 104 | 99 | 94 | 91 | 95 | 92 | 89 | 92 | 89 | 87 | 89 | 87 | 85 | 83 |
| 3 | 100 | 92 | 87 | 82 | 98 | 91 | 86 | 81 | 88 | 84 | 80 | 86 | 82 | 79 | 83 | 80 | 78 | 76 |
| 4 | 94 | 85 | 79 | 74 | 92 | 84 | 78 | 74 | 82 | 77 | 73 | 80 | 75 | 72 | 78 | 74 | 71 | 69 |
| 5 | 88 | 79 | 72 | 67 | 87 | 78 | 72 | 67 | 76 | 71 | 66 | 74 | 70 | 66 | 73 | 69 | 65 | 64 |
| 6 | 83 | 73 | 67 | 62 | 82 | 73 | 66 | 62 | 71 | 65 | 61 | 69 | 65 | 61 | 68 | 64 | 60 | 59 |
| 7 | 79 | 68 | 62 | 57 | 77 | 68 | 61 | 57 | 66 | 61 | 57 | 65 | 60 | 56 | 64 | 59 | 56 | 54 |
| 8 | 75 | 64 | 57 | 53 | 73 | 63 | 57 | 53 | 62 | 57 | 53 | 61 | 56 | 52 | 60 | 56 | 52 | 51 |
| 9 | 71 | 60 | 54 | 49 | 70 | 60 | 53 | 49 | 59 | 53 | 49 | 58 | 53 | 49 | 57 | 52 | 49 | 47 |
| 10 | 67 | 57 | 50 | 46 | 66 | 56 | 50 | 46 | 55 | 50 | 46 | 55 | 49 | 46 | 54 | 49 | 46 | 44 |

## AVERAGE LUMINANCE (cd/sqm):

| | 0° | 45° | 90° |
|---|---|---|---|
| 0° | 81172 | 81172 | 81172 |
| 5° | 84340 | 83310 | 81404 |
| 10° | 71737 | 79087 | 81532 |
| 15° | 46440 | 65124 | 82972 |
| 20° | 32186 | 47578 | 81090 |
| 25° | 25314 | 36442 | 68517 |
| 30° | 21682 | 30033 | 53907 |
| 35° | 17838 | 25508 | 40674 |
| 40° | 13832 | 21654 | 30328 |
| 45° | 10227 | 17469 | 23459 |
| 50° | 7494 | 13411 | 18644 |
| 55° | 5606 | 9546 | 13622 |
| 60° | 3939 | 6431 | 9208 |
| 65° | 2765 | 4141 | 6218 |
| 70° | 1926 | 2775 | 4059 |
| 75° | 1422 | 1696 | 2819 |
| 80° | 855 | 1264 | 2120 |
| 85° | 815 | 815 | 815 |

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TEST NUMBER: P895859
CATALOG NUMBER: GRZ-15L-935-30x60-X-UNV-STD-1F

**ZONAL LUMENS:**

| Zone | Lumens | % Fixture |
|---|---|---|
| 0°-10° | 118.9 | 10.3 |
| 10°-20° | 270.9 | 23.5 |
| 20°-30° | 276.8 | 24.0 |
| 30°-40° | 221.5 | 19.2 |
| 40°-50° | 148.1 | 12.8 |
| 50°-60° | 78.0 | 6.8 |
| 60°-70° | 29.5 | 2.6 |
| 70°-80° | 8.7 | 0.8 |
| 80°-90° | 1.3 | 0.1 |
| 90°-100° | 0.0 | 0.0 |
| 100°-110° | 0.0 | 0.0 |
| 110°-120° | 0.0 | 0.0 |
| 120°-130° | 0.0 | 0.0 |
| 130°-140° | 0.0 | 0.0 |
| 140°-150° | 0.0 | 0.0 |
| 150°-160° | 0.0 | 0.0 |
| 160°-170° | 0.0 | 0.0 |
| 170°-180° | 0.0 | 0.0 |
| 0°-30° | 666.5 | 57.8 |
| 0°-40° | 888.0 | 77.0 |
| 0°-60° | 1114.1 | 96.6 |
| 0°-90° | 1153.6 | 100.0 |
| 90°-120° | 0.0 | 0.0 |
| 90°-150° | 0.0 | 0.0 |
| 90°-180° | 0.0 | 0.0 |
| 0°-180° | 1153.6 | 100.0 |

**CANDELA DISTRIBUTION:**

| | 0° | 22.5° | 45° | 67.5° | 90° | Flux |
|---|---|---|---|---|---|---|
| 0° | 1257 | 1257 | 1257 | 1257 | 1257 | |
| 5° | 1301 | 1282 | 1285 | 1266 | 1256 | 117 |
| 15° | 695 | 766 | 974 | 1182 | 1241 | 198 |
| 25° | 355 | 384 | 512 | 841 | 962 | 167 |
| 35° | 226 | 246 | 324 | 468 | 516 | 141 |
| 45° | 112 | 130 | 191 | 253 | 257 | 88 |
| 55° | 50 | 56 | 85 | 116 | 121 | 45 |
| 65° | 18 | 20 | 27 | 37 | 41 | 19 |
| 75° | 6 | 6 | 7 | 9 | 11 | 6 |
| 85° | 1 | 1 | 1 | 1 | 1 | 1 |
| 90° | 0 | 0 | 0 | 0 | 0 | |

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Scaled Data Report

TEST NUMBER: P895859
CATALOG NUMBER: GRZ-15L-935-30x60-X-UNV-STD-1F

**CANDELA DISTRIBUTION (FULL):**

| | 0° | 5° | 15° | 25° | 35° | 45° | 55° | 65° | 75° | 85° | 90° |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0° | 1257.1 | 1257.1 | 1257.1 | 1257.1 | 1257.1 | 1257.1 | 1257.1 | 1257.1 | 1257.1 | 1257.1 | 1257.1 |
| 2.5° | 1270.6 | 1269.5 | 1281.9 | 1272.9 | 1276.3 | 1272.9 | 1262.7 | 1257.1 | 1255.9 | 1244.6 | 1250.3 |
| 5° | 1301.2 | 1283.1 | 1286.5 | 1280.8 | 1286.5 | 1285.3 | 1274.0 | 1267.2 | 1261.6 | 1254.8 | 1255.9 |
| 7.5° | 1227.7 | 1229.9 | 1240.1 | 1244.6 | 1260.5 | 1266.1 | 1260.5 | 1255.9 | 1251.4 | 1248.0 | 1249.1 |
| 10° | 1094.1 | 1102.0 | 1116.7 | 1146.2 | 1179.0 | 1206.2 | 1217.5 | 1229.9 | 1240.1 | 1241.2 | 1243.5 |
| 12.5° | 900.7 | 912.0 | 935.7 | 967.4 | 1039.8 | 1105.4 | 1160.9 | 1203.9 | 1228.8 | 1242.4 | 1240.1 |
| 15° | 694.7 | 698.1 | 727.5 | 779.5 | 858.8 | 974.2 | 1083.9 | 1171.1 | 1216.3 | 1248.0 | 1241.2 |
| 17.5° | 553.3 | 557.8 | 581.6 | 621.2 | 697.0 | 824.9 | 988.9 | 1118.9 | 1201.6 | 1224.3 | 1218.6 |
| 20° | 468.4 | 465.0 | 483.1 | 516.0 | 579.3 | 692.4 | 863.3 | 1037.5 | 1141.7 | 1173.4 | 1180.1 |
| 22.5° | 400.5 | 403.9 | 415.2 | 441.2 | 496.8 | 590.6 | 746.7 | 931.2 | 1046.6 | 1081.6 | 1087.3 |
| 25° | 355.3 | 358.7 | 370.0 | 388.1 | 433.3 | 511.5 | 646.1 | 812.3 | 925.5 | 959.5 | 961.7 |
| 27.5° | 325.9 | 323.6 | 331.5 | 345.1 | 384.7 | 451.4 | 562.4 | 700.3 | 805.5 | 839.6 | 841.9 |
| 30° | 290.8 | 289.7 | 297.6 | 312.3 | 344.0 | 402.8 | 496.8 | 608.7 | 683.4 | 716.2 | 723.0 |
| 32.5° | 259.1 | 258.0 | 267.0 | 279.5 | 311.2 | 362.0 | 443.5 | 530.7 | 581.6 | 608.7 | 615.5 |
| 35° | 226.3 | 227.5 | 234.2 | 250.1 | 278.4 | 323.6 | 398.2 | 459.3 | 495.6 | 509.2 | 516.0 |
| 37.5° | 194.7 | 195.8 | 204.8 | 220.7 | 248.9 | 289.7 | 349.6 | 397.1 | 418.6 | 428.8 | 427.6 |
| 40° | 164.1 | 166.4 | 172.0 | 190.1 | 218.4 | 256.9 | 305.5 | 340.6 | 355.3 | 356.4 | 359.8 |
| 42.5° | 136.9 | 136.9 | 145.9 | 160.6 | 187.9 | 224.1 | 267.0 | 291.9 | 303.2 | 302.1 | 299.8 |
| 45° | 112.0 | 113.1 | 118.8 | 133.5 | 158.3 | 191.3 | 228.6 | 251.2 | 258.0 | 253.5 | 256.9 |
| 47.5° | 91.6 | 92.7 | 97.3 | 110.8 | 132.3 | 164.1 | 193.5 | 215.0 | 220.7 | 217.3 | 217.3 |
| 50° | 74.6 | 75.8 | 79.2 | 89.3 | 107.4 | 133.5 | 160.6 | 178.8 | 184.5 | 183.3 | 185.6 |
| 52.5° | 61.1 | 61.1 | 64.5 | 72.4 | 87.1 | 108.6 | 130.1 | 145.9 | 150.4 | 149.3 | 148.2 |
| 55° | 49.8 | 49.8 | 52.0 | 57.7 | 69.0 | 84.8 | 102.9 | 115.4 | 118.8 | 119.9 | 121.0 |
| 57.5° | 39.6 | 39.6 | 40.7 | 45.2 | 53.2 | 65.6 | 79.2 | 88.2 | 91.6 | 92.7 | 93.9 |
| 60° | 30.5 | 30.5 | 32.8 | 35.1 | 41.8 | 49.8 | 58.8 | 65.6 | 70.1 | 70.1 | 71.3 |
| 62.5° | 23.8 | 23.8 | 24.9 | 27.1 | 31.7 | 37.3 | 43.0 | 48.6 | 50.9 | 53.2 | 54.3 |
| 65° | 18.1 | 18.1 | 19.2 | 20.4 | 23.8 | 27.1 | 31.7 | 36.2 | 38.5 | 39.6 | 40.7 |
| 67.5° | 13.6 | 13.6 | 13.6 | 15.8 | 18.1 | 20.4 | 22.6 | 26.0 | 27.1 | 29.4 | 30.5 |
| 70° | 10.2 | 10.2 | 10.2 | 11.3 | 12.4 | 14.7 | 15.8 | 18.1 | 20.4 | 21.5 | 21.5 |
| 72.5° | 7.9 | 7.9 | 7.9 | 7.9 | 9.0 | 10.2 | 11.3 | 12.4 | 14.7 | 15.8 | 15.8 |
| 75° | 5.7 | 5.7 | 5.7 | 5.7 | 6.8 | 6.8 | 7.9 | 9.0 | 10.2 | 11.3 | 11.3 |
| 77.5° | 4.5 | 4.5 | 3.4 | 4.5 | 4.5 | 4.5 | 5.7 | 5.7 | 6.8 | 7.9 | 7.9 |
| 80° | 2.3 | 2.3 | 2.3 | 2.3 | 3.4 | 3.4 | 3.4 | 4.5 | 4.5 | 4.5 | 5.7 |
| 82.5° | 1.1 | 1.1 | 1.1 | 1.1 | 2.3 | 2.3 | 2.3 | 2.3 | 2.3 | 3.4 | 3.4 |
| 85° | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 |
| 87.5° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 90° | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

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

Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

iO LED

Report Number: SP1-2101-124-3

Luminaire Tested: GRZ-05L-935-10X10-X-UNV-STD-2F

Test Date: 02/10/2021

Report Generated By controller / USPTCWHP6086842

## Test Information

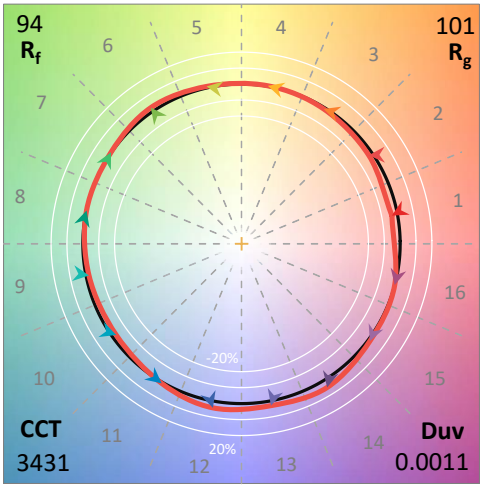
| | |
|---|---|
| Test Method: | LM-79-08 |
| Report Number: | SP1-2101-124-3 |
| Test Lab: | COOPER LIGHTING SOLUTIONS |
| Photometer: | SP1 |
| Measurement Geometry: | 4π |
| Issue Date: | 02/10/2021 |
| Manufacturer: | COOPER LIGHTING SOLUTIONS (FORMERLY EATON) |
| Product Line: | iO LED |
| Catalog Number: | **GRZ-05L-935-10X10-X-UNV-STD-2F** |
| Description: | IO LED Wall Grazer GRZ |

## Spectral Parameters

| | |
|---|---|
| CCT (K): | 3431 |
| CIE u': | 0.2369 |
| CIE v': | 0.5141 |
| Duv: | 0.0011 |
| CIE x: | 0.4104 |
| CIE y: | 0.3958 |
| CIE z: | 0.1938 |
| Peak Wavelength (nm): | 624 |
| Dominant Wavelength (nm): | 580 |
| Purity: | 42.2 |

| | |
|---|---|
| CRI (Ra): | 94.0 |
| R1: | 94.7 |
| R2: | 95.5 |
| R3: | 95.0 |
| R4: | 95.4 |
| R5: | 94.1 |
| R6: | 94.0 |
| R7: | 95.4 |
| R8: | 88.3 |
| R9: | 69.9 |
| R10: | 88.4 |
| R11: | 95.7 |
| R12: | 83.2 |
| R13: | 94.8 |
| R14: | 96.6 |

| | |
|---|---|
| Rf: | 93.6 |
| Rg: | 100.6 |




## Test Conditions

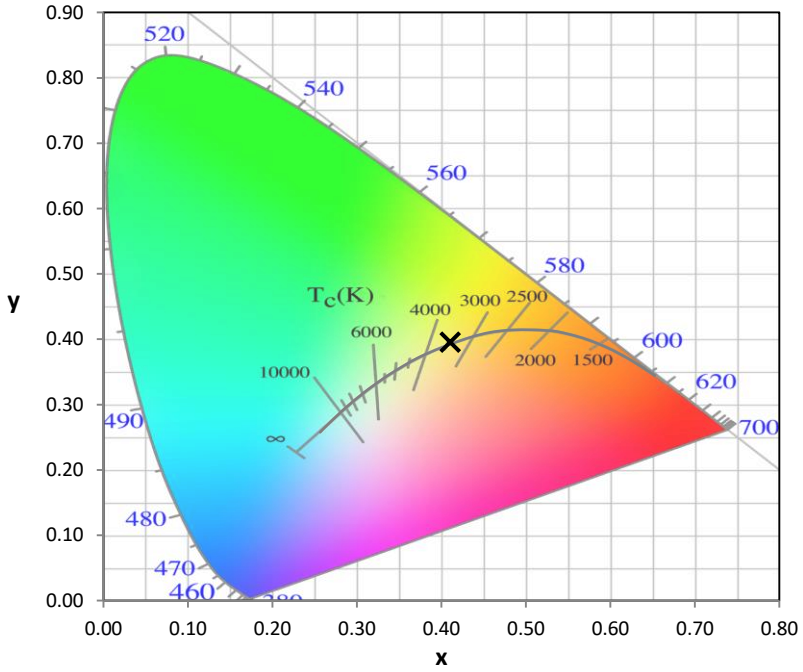
| | |
|---|---|
| Stabilization Time: | 57M |
| Operation Time: | 12H |
| Room Temperature (°C) / RH%: | 25.5/38% |
| Sphere Temperature (°C): | 24.4 |

REPORT NUMBER: SP1-2101-124-3

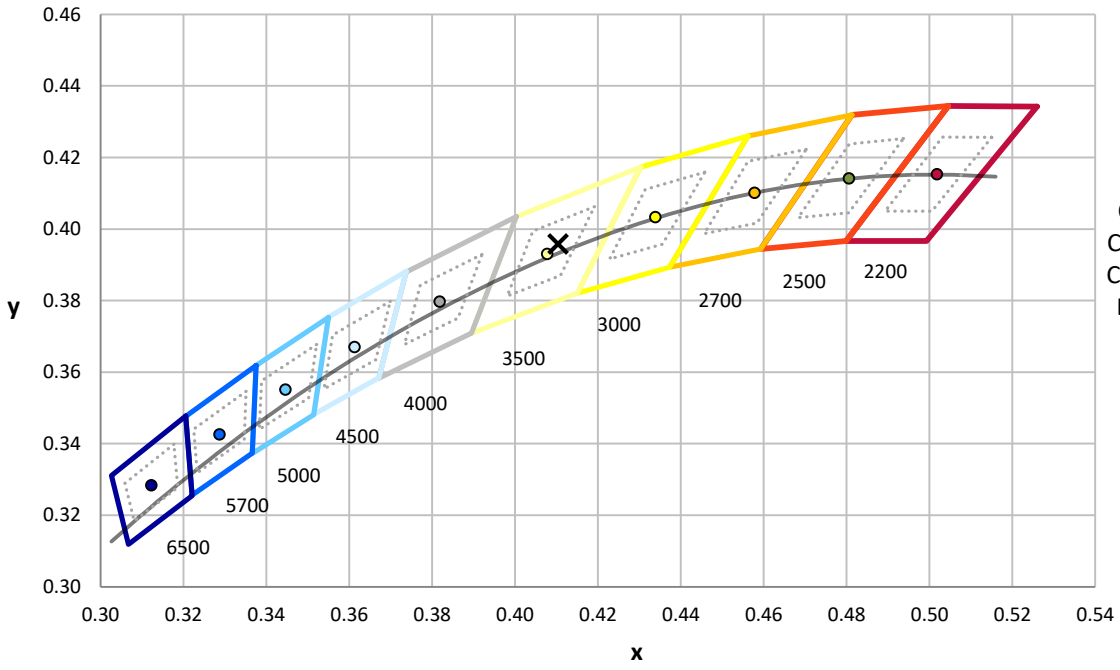
| Measurement and Test Equipment | | | |
|---|---|---|---|
| Instrument | Identification Number | Calibration Date | Calibration Due Date |
| Photometer | IN0058 | 1/31/2021 | 7/31/2021 |
| Power Meter | IN0071 | 12/1/2020 | 12/1/2021 |
| AC Power Source | IN0063 | 12/1/2020 | 12/1/2021 |
| DC Power Source | IN0208 | 12/1/2020 | 12/1/2021 |
| Sphere Thermometer | IN0085 | 12/1/2020 | 12/1/2021 |
| Room Thermometer | IN0046 | 12/1/2020 | 12/1/2021 |

REPORT NUMBER: SP1-2101-124-3

## CIE 1931 Chromaticity Diagram




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

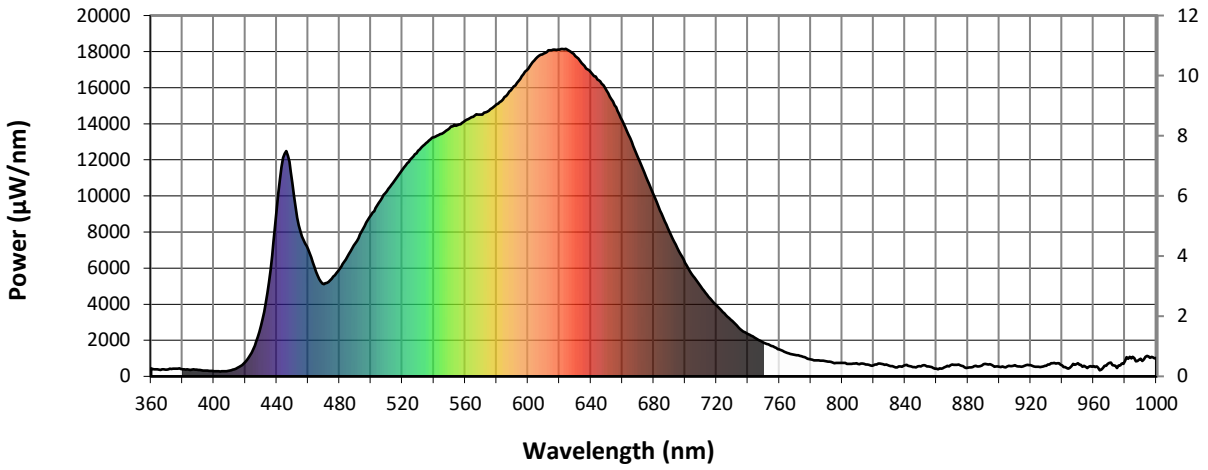



CCT = 3431K
CIE x = 0.4104
CIE y = 0.3958
Duv = 0.0011

Point lies inside the ANSI 3500K 4-step quadrangle

REPORT NUMBER: SP1-2101-124-3

## Photopic Flux vs. Wavelength

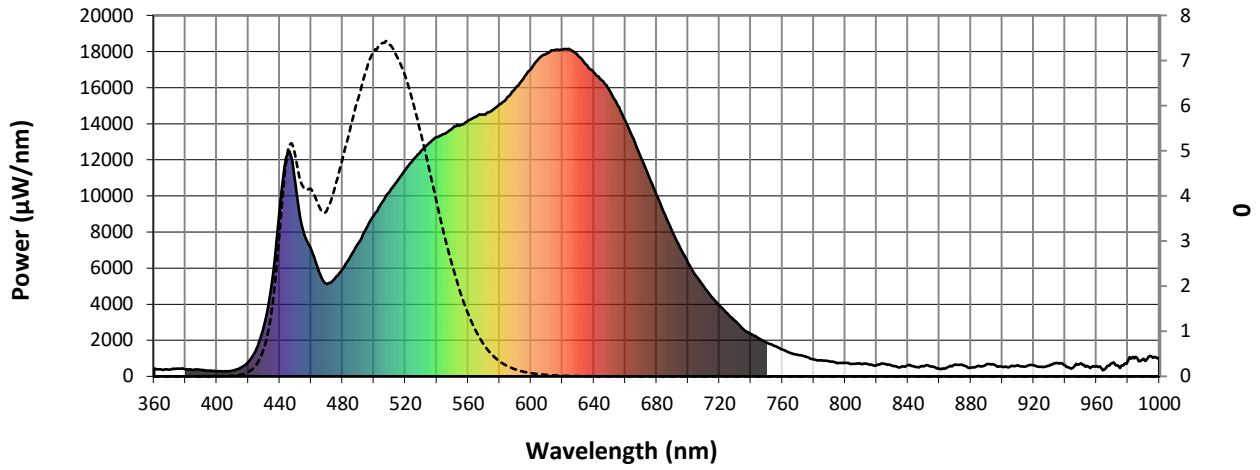



######

| λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 436 | 0.0 | 490 | 7373 | 1.0 | 620 | 18112 | 4.7 | 750 | 1864 | 0.0 | 880 | 485 | 0.0 |
| 365 | 370 | 0.0 | 495 | 8181 | 1.5 | 625 | 18107 | 4.0 | 755 | 1693 | 0.0 | 885 | 593 | 0.0 |
| 370 | 381 | 0.0 | 500 | 8943 | 2.0 | 630 | 17758 | 3.2 | 760 | 1498 | 0.0 | 890 | 677 | 0.0 |
| 375 | 432 | 0.0 | 505 | 9613 | 2.7 | 635 | 17291 | 2.6 | 765 | 1302 | 0.0 | 895 | 646 | 0.0 |
| 380 | 398 | 0.0 | 510 | 10245 | 3.5 | 640 | 16854 | 2.0 | 770 | 1180 | 0.0 | 900 | 526 | 0.0 |
| 385 | 359 | 0.0 | 515 | 10835 | 4.5 | 645 | 16410 | 1.6 | 775 | 1079 | 0.0 | 905 | 557 | 0.0 |
| 390 | 355 | 0.0 | 520 | 11465 | 5.6 | 650 | 15843 | 1.2 | 780 | 946 | 0.0 | 910 | 613 | 0.0 |
| 395 | 320 | 0.0 | 525 | 12004 | 6.4 | 655 | 15029 | 0.9 | 785 | 883 | 0.0 | 915 | 556 | 0.0 |
| 400 | 290 | 0.0 | 530 | 12512 | 7.4 | 660 | 14175 | 0.6 | 790 | 832 | 0.0 | 920 | 623 | 0.0 |
| 405 | 278 | 0.0 | 535 | 12925 | 8.0 | 665 | 13195 | 0.4 | 795 | 731 | 0.0 | 925 | 528 | 0.0 |
| 410 | 327 | 0.0 | 540 | 13254 | 8.6 | 670 | 12132 | 0.3 | 800 | 744 | 0.0 | 930 | 586 | 0.0 |
| 415 | 471 | 0.0 | 545 | 13437 | 8.9 | 675 | 11067 | 0.2 | 805 | 688 | 0.0 | 935 | 744 | 0.0 |
| 420 | 803 | 0.0 | 550 | 13744 | 9.3 | 680 | 10056 | 0.1 | 810 | 699 | 0.0 | 940 | 610 | 0.0 |
| 425 | 1501 | 0.0 | 555 | 13925 | 9.5 | 685 | 9011 | 0.1 | 815 | 651 | 0.0 | 945 | 486 | 0.0 |
| 430 | 2800 | 0.0 | 560 | 14164 | 9.6 | 690 | 8032 | 0.0 | 820 | 620 | 0.0 | 950 | 719 | 0.0 |
| 435 | 5221 | 0.1 | 565 | 14379 | 9.6 | 695 | 7112 | 0.0 | 825 | 686 | 0.0 | 955 | 527 | 0.0 |
| 440 | 9255 | 0.1 | 570 | 14511 | 9.4 | 700 | 6301 | 0.0 | 830 | 578 | 0.0 | 960 | 561 | 0.0 |
| 445 | 12350 | 0.3 | 575 | 14729 | 9.2 | 705 | 5570 | 0.0 | 835 | 502 | 0.0 | 965 | 364 | 0.0 |
| 450 | 10708 | 0.3 | 580 | 15069 | 9.0 | 710 | 4970 | 0.0 | 840 | 624 | 0.0 | 970 | 739 | 0.0 |
| 455 | 8053 | 0.3 | 585 | 15482 | 8.6 | 715 | 4396 | 0.0 | 845 | 523 | 0.0 | 975 | 457 | 0.0 |
| 460 | 7058 | 0.3 | 590 | 15975 | 8.3 | 720 | 3921 | 0.0 | 850 | 555 | 0.0 | 980 | 848 | 0.0 |
| 465 | 5809 | 0.3 | 595 | 16476 | 7.8 | 725 | 3489 | 0.0 | 855 | 553 | 0.0 | 985 | 1084 | 0.0 |
| 470 | 5111 | 0.3 | 600 | 17051 | 7.3 | 730 | 3068 | 0.0 | 860 | 424 | 0.0 | 990 | 980 | 0.0 |
| 475 | 5409 | 0.4 | 605 | 17607 | 6.8 | 735 | 2631 | 0.0 | 865 | 489 | 0.0 | 995 | 1093 | 0.0 |
| 480 | 5958 | 0.6 | 610 | 17893 | 6.1 | 740 | 2336 | 0.0 | 870 | 652 | 0.0 | 1000 | 1033 | 0.0 |
| 485 | 6631 | 0.8 | 615 | 18072 | 5.5 | 745 | 2108 | 0.0 | 875 | 622 | 0.0 | | | |

REPORT NUMBER: SP1-2101-124-3

## Scotopic Flux vs. Wavelength

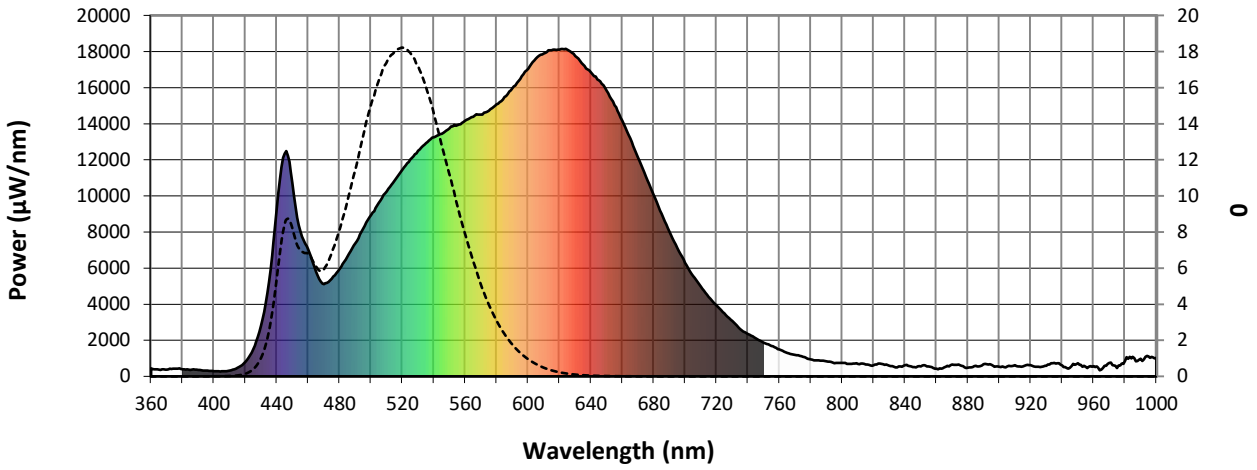



**Scotopic Lumens: 1600.8** **S/P: 1.59**

| λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 436 | 0.0 | 490 | 7373 | 11.4 | 620 | 18112 | 0.2 | 750 | 1864 | 0.0 | 880 | 485 | 0.0 |
| 365 | 370 | 0.0 | 495 | 8181 | 13.2 | 625 | 18107 | 0.2 | 755 | 1693 | 0.0 | 885 | 593 | 0.0 |
| 370 | 381 | 0.0 | 500 | 8943 | 15.0 | 630 | 17758 | 0.1 | 760 | 1498 | 0.0 | 890 | 677 | 0.0 |
| 375 | 432 | 0.0 | 505 | 9613 | 16.3 | 635 | 17291 | 0.1 | 765 | 1302 | 0.0 | 895 | 646 | 0.0 |
| 380 | 398 | 0.0 | 510 | 10245 | 17.4 | 640 | 16854 | 0.0 | 770 | 1180 | 0.0 | 900 | 526 | 0.0 |
| 385 | 359 | 0.0 | 515 | 10835 | 18.0 | 645 | 16410 | 0.0 | 775 | 1079 | 0.0 | 905 | 557 | 0.0 |
| 390 | 355 | 0.0 | 520 | 11465 | 18.2 | 650 | 15843 | 0.0 | 780 | 946 | 0.0 | 910 | 613 | 0.0 |
| 395 | 320 | 0.0 | 525 | 12004 | 18.0 | 655 | 15029 | 0.0 | 785 | 883 | 0.0 | 915 | 556 | 0.0 |
| 400 | 290 | 0.0 | 530 | 12512 | 17.3 | 660 | 14175 | 0.0 | 790 | 832 | 0.0 | 920 | 623 | 0.0 |
| 405 | 278 | 0.0 | 535 | 12925 | 16.1 | 665 | 13195 | 0.0 | 795 | 731 | 0.0 | 925 | 528 | 0.0 |
| 410 | 327 | 0.0 | 540 | 13254 | 14.6 | 670 | 12132 | 0.0 | 800 | 744 | 0.0 | 930 | 586 | 0.0 |
| 415 | 471 | 0.0 | 545 | 13437 | 12.9 | 675 | 11067 | 0.0 | 805 | 688 | 0.0 | 935 | 744 | 0.0 |
| 420 | 803 | 0.1 | 550 | 13744 | 11.2 | 680 | 10056 | 0.0 | 810 | 699 | 0.0 | 940 | 610 | 0.0 |
| 425 | 1501 | 0.4 | 555 | 13925 | 9.5 | 685 | 9011 | 0.0 | 815 | 651 | 0.0 | 945 | 486 | 0.0 |
| 430 | 2800 | 1.0 | 560 | 14164 | 7.9 | 690 | 8032 | 0.0 | 820 | 620 | 0.0 | 950 | 719 | 0.0 |
| 435 | 5221 | 2.3 | 565 | 14379 | 6.5 | 695 | 7112 | 0.0 | 825 | 686 | 0.0 | 955 | 527 | 0.0 |
| 440 | 9255 | 5.2 | 570 | 14511 | 5.1 | 700 | 6301 | 0.0 | 830 | 578 | 0.0 | 960 | 561 | 0.0 |
| 445 | 12350 | 8.3 | 575 | 14729 | 4.0 | 705 | 5570 | 0.0 | 835 | 502 | 0.0 | 965 | 364 | 0.0 |
| 450 | 10708 | 8.3 | 580 | 15069 | 3.1 | 710 | 4970 | 0.0 | 840 | 624 | 0.0 | 970 | 739 | 0.0 |
| 455 | 8053 | 7.0 | 585 | 15482 | 2.4 | 715 | 4396 | 0.0 | 845 | 523 | 0.0 | 975 | 457 | 0.0 |
| 460 | 7058 | 6.8 | 590 | 15975 | 1.8 | 720 | 3921 | 0.0 | 850 | 555 | 0.0 | 980 | 848 | 0.0 |
| 465 | 5809 | 6.1 | 595 | 16476 | 1.3 | 725 | 3489 | 0.0 | 855 | 553 | 0.0 | 985 | 1084 | 0.0 |
| 470 | 5111 | 5.9 | 600 | 17051 | 1.0 | 730 | 3068 | 0.0 | 860 | 424 | 0.0 | 990 | 980 | 0.0 |
| 475 | 5409 | 6.8 | 605 | 17607 | 0.7 | 735 | 2631 | 0.0 | 865 | 489 | 0.0 | 995 | 1093 | 0.0 |
| 480 | 5958 | 8.0 | 610 | 17893 | 0.5 | 740 | 2336 | 0.0 | 870 | 652 | 0.0 | 1000 | 1033 | 0.0 |
| 485 | 6631 | 9.6 | 615 | 18072 | 0.3 | 745 | 2108 | 0.0 | 875 | 622 | 0.0 | | | |

REPORT NUMBER: SP1-2101-124-3

## Melanopic Flux vs. Wavelength




**Melanopic Lumens: 631** **M/P: 0.63**

| λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) | λ (nm) | Power (µW/nm) | Lumens (ϕ/nm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | 436 | 0.0 | 490 | 7373 | 6.1 | 620 | 18112 | 0.0 | 750 | 1864 | 0.0 | 880 | 485 | 0.0 |
| 365 | 370 | 0.0 | 495 | 8181 | 6.8 | 625 | 18107 | 0.0 | 755 | 1693 | 0.0 | 885 | 593 | 0.0 |
| 370 | 381 | 0.0 | 500 | 8943 | 7.2 | 630 | 17758 | 0.0 | 760 | 1498 | 0.0 | 890 | 677 | 0.0 |
| 375 | 432 | 0.0 | 505 | 9613 | 7.4 | 635 | 17291 | 0.0 | 765 | 1302 | 0.0 | 895 | 646 | 0.0 |
| 380 | 398 | 0.0 | 510 | 10245 | 7.4 | 640 | 16854 | 0.0 | 770 | 1180 | 0.0 | 900 | 526 | 0.0 |
| 385 | 359 | 0.0 | 515 | 10835 | 7.1 | 645 | 16410 | 0.0 | 775 | 1079 | 0.0 | 905 | 557 | 0.0 |
| 390 | 355 | 0.0 | 520 | 11465 | 6.7 | 650 | 15843 | 0.0 | 780 | 946 | 0.0 | 910 | 613 | 0.0 |
| 395 | 320 | 0.0 | 525 | 12004 | 6.1 | 655 | 15029 | 0.0 | 785 | 883 | 0.0 | 915 | 556 | 0.0 |
| 400 | 290 | 0.0 | 530 | 12512 | 5.4 | 660 | 14175 | 0.0 | 790 | 832 | 0.0 | 920 | 623 | 0.0 |
| 405 | 278 | 0.0 | 535 | 12925 | 4.7 | 665 | 13195 | 0.0 | 795 | 731 | 0.0 | 925 | 528 | 0.0 |
| 410 | 327 | 0.0 | 540 | 13254 | 3.9 | 670 | 12132 | 0.0 | 800 | 744 | 0.0 | 930 | 586 | 0.0 |
| 415 | 471 | 0.0 | 545 | 13437 | 3.1 | 675 | 11067 | 0.0 | 805 | 688 | 0.0 | 935 | 744 | 0.0 |
| 420 | 803 | 0.1 | 550 | 13744 | 2.5 | 680 | 10056 | 0.0 | 810 | 699 | 0.0 | 940 | 610 | 0.0 |
| 425 | 1501 | 0.2 | 555 | 13925 | 1.9 | 685 | 9011 | 0.0 | 815 | 651 | 0.0 | 945 | 486 | 0.0 |
| 430 | 2800 | 0.6 | 560 | 14164 | 1.4 | 690 | 8032 | 0.0 | 820 | 620 | 0.0 | 950 | 719 | 0.0 |
| 435 | 5221 | 1.4 | 565 | 14379 | 1.0 | 695 | 7112 | 0.0 | 825 | 686 | 0.0 | 955 | 527 | 0.0 |
| 440 | 9255 | 3.1 | 570 | 14511 | 0.7 | 700 | 6301 | 0.0 | 830 | 578 | 0.0 | 960 | 561 | 0.0 |
| 445 | 12350 | 4.9 | 575 | 14729 | 0.5 | 705 | 5570 | 0.0 | 835 | 502 | 0.0 | 965 | 364 | 0.0 |
| 450 | 10708 | 4.9 | 580 | 15069 | 0.3 | 710 | 4970 | 0.0 | 840 | 624 | 0.0 | 970 | 739 | 0.0 |
| 455 | 8053 | 4.2 | 585 | 15482 | 0.2 | 715 | 4396 | 0.0 | 845 | 523 | 0.0 | 975 | 457 | 0.0 |
| 460 | 7058 | 4.2 | 590 | 15975 | 0.2 | 720 | 3921 | 0.0 | 850 | 555 | 0.0 | 980 | 848 | 0.0 |
| 465 | 5809 | 3.8 | 595 | 16476 | 0.1 | 725 | 3489 | 0.0 | 855 | 553 | 0.0 | 985 | 1084 | 0.0 |
| 470 | 5111 | 3.7 | 600 | 17051 | 0.1 | 730 | 3068 | 0.0 | 860 | 424 | 0.0 | 990 | 980 | 0.0 |
| 475 | 5409 | 4.1 | 605 | 17607 | 0.0 | 735 | 2631 | 0.0 | 865 | 489 | 0.0 | 995 | 1093 | 0.0 |
| 480 | 5958 | 4.8 | 610 | 17893 | 0.0 | 740 | 2336 | 0.0 | 870 | 652 | 0.0 | 1000 | 1033 | 0.0 |
| 485 | 6631 | 5.5 | 615 | 18072 | 0.0 | 745 | 2108 | 0.0 | 875 | 622 | 0.0 | | | |

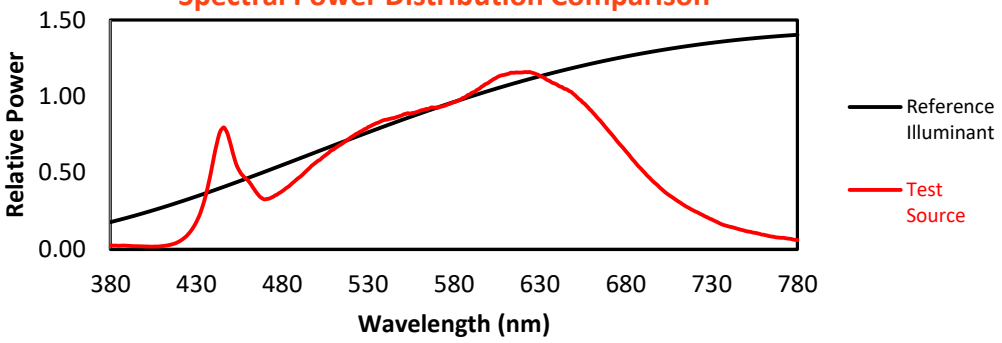
REPORT NUMBER: SP1-2101-124-3

# TM-30-18

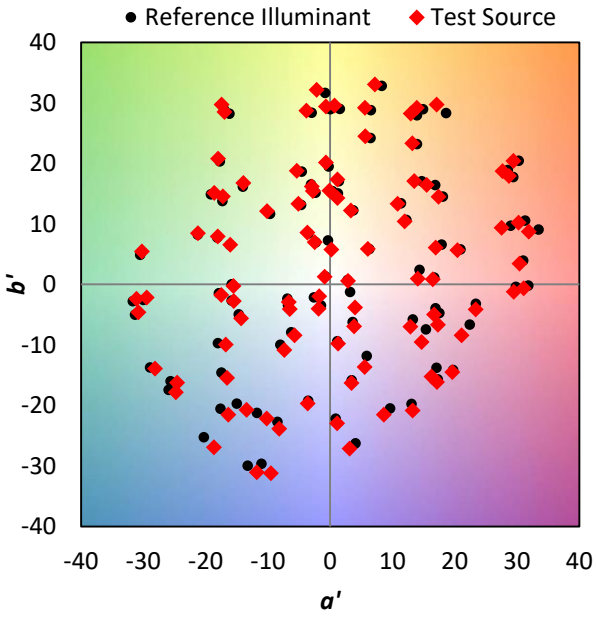
## Summary

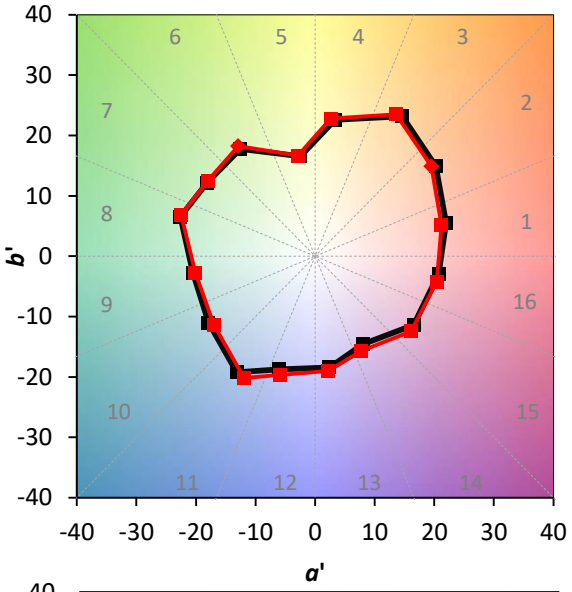
$R_f$ = 93.6
$R_g$ = 100.6
CIE $R_a$ = 94.0
$R_9$ = 69.9

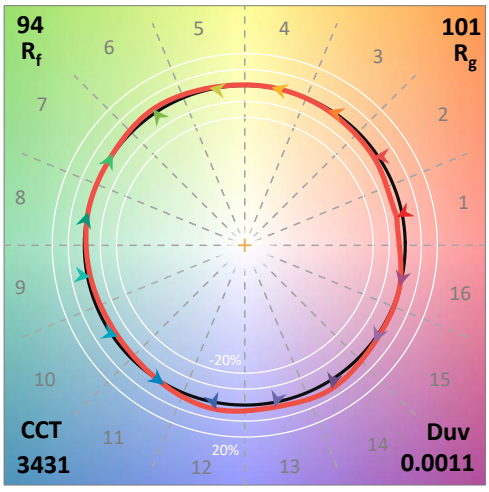
## Spectral Power Distribution Comparison

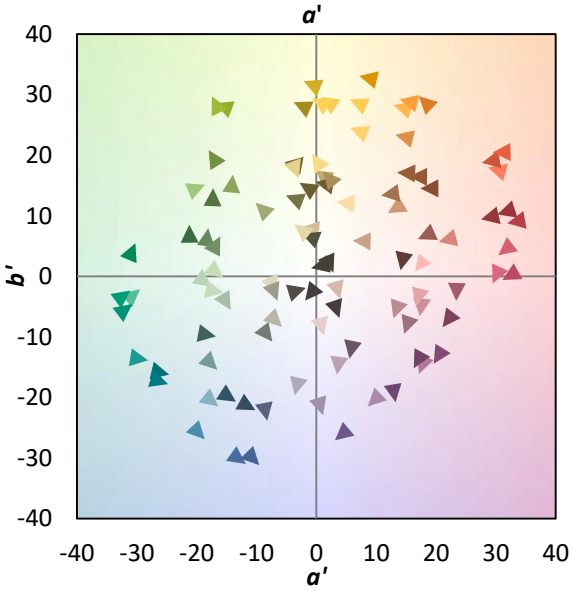



## Color Vector Graphics



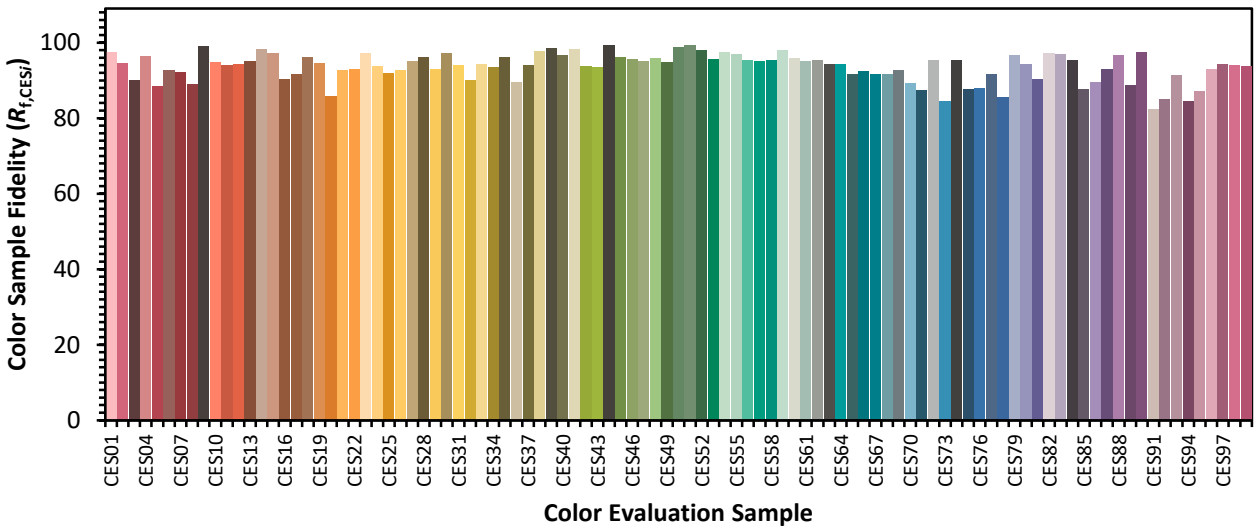



REPORT NUMBER: SP1-2101-124-3

# TM-30-18

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

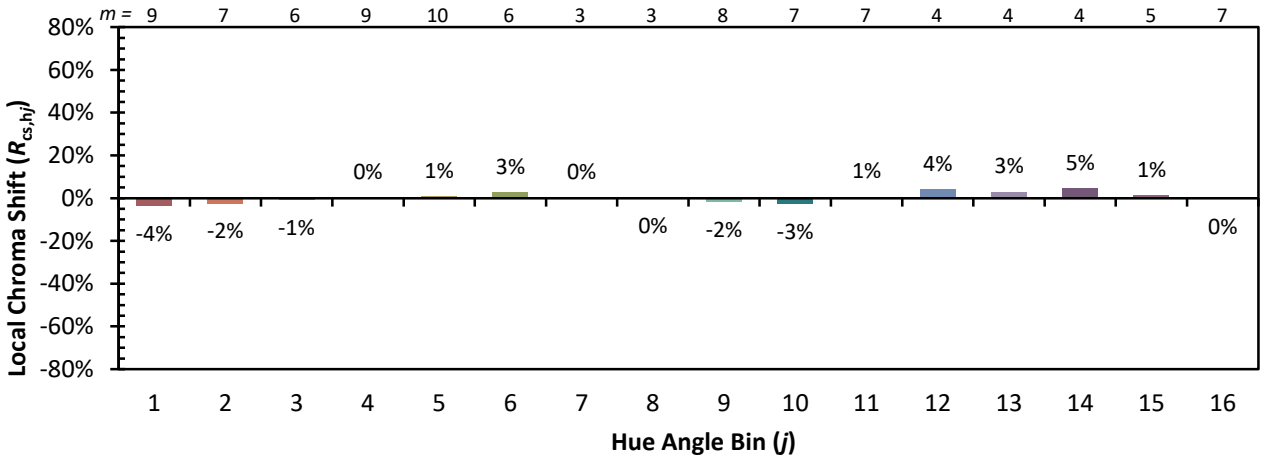
| | | | |
|---|---|---|---|
| CES01 = 86 | CES26 = 93 | CES51 = 99 | CES76 = 88 |
| CES02 = 62 | CES27 = 95 | CES52 = 98 | CES77 = 92 |
| CES03 = 31 | CES28 = 96 | CES53 = 96 | CES78 = 86 |
| CES04 = 70 | CES29 = 93 | CES54 = 98 | CES79 = 97 |
| CES05 = 50 | CES30 = 97 | CES55 = 97 | CES80 = 94 |
| CES06 = 51 | CES31 = 94 | CES56 = 95 | CES81 = 90 |
| CES07 = 43 | CES32 = 90 | CES57 = 95 | CES82 = 97 |
| CES08 = 42 | CES33 = 94 | CES58 = 96 | CES83 = 97 |
| CES09 = 29 | CES34 = 93 | CES59 = 98 | CES84 = 95 |
| CES10 = 75 | CES35 = 96 | CES60 = 96 | CES85 = 88 |
| CES11 = 58 | CES36 = 90 | CES61 = 95 | CES86 = 90 |
| CES12 = 64 | CES37 = 94 | CES62 = 95 | CES87 = 93 |
| CES13 = 43 | CES38 = 98 | CES63 = 94 | CES88 = 97 |
| CES14 = 74 | CES39 = 99 | CES64 = 94 | CES89 = 89 |
| CES15 = 71 | CES40 = 97 | CES65 = 92 | CES90 = 97 |
| CES16 = 48 | CES41 = 98 | CES66 = 92 | CES91 = 82 |
| CES17 = 49 | CES42 = 94 | CES67 = 92 | CES92 = 85 |
| CES18 = 56 | CES43 = 94 | CES68 = 92 | CES93 = 91 |
| CES19 = 71 | CES44 = 99 | CES69 = 93 | CES94 = 84 |
| CES20 = 66 | CES45 = 96 | CES70 = 89 | CES95 = 87 |
| CES21 = 86 | CES46 = 96 | CES71 = 88 | CES96 = 93 |
| CES22 = 78 | CES47 = 95 | CES72 = 95 | CES97 = 94 |
| CES23 = 91 | CES48 = 96 | CES73 = 85 | CES98 = 94 |
| CES24 = 90 | CES49 = 95 | CES74 = 95 | CES99 = 94 |
| CES25 = 71 | CES50 = 99 | CES75 = 88 | |

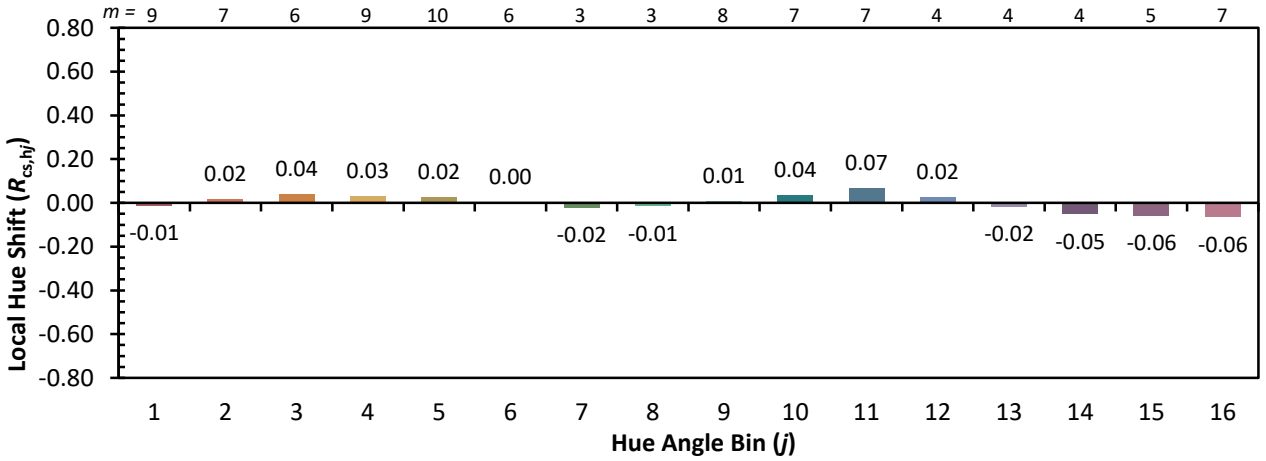


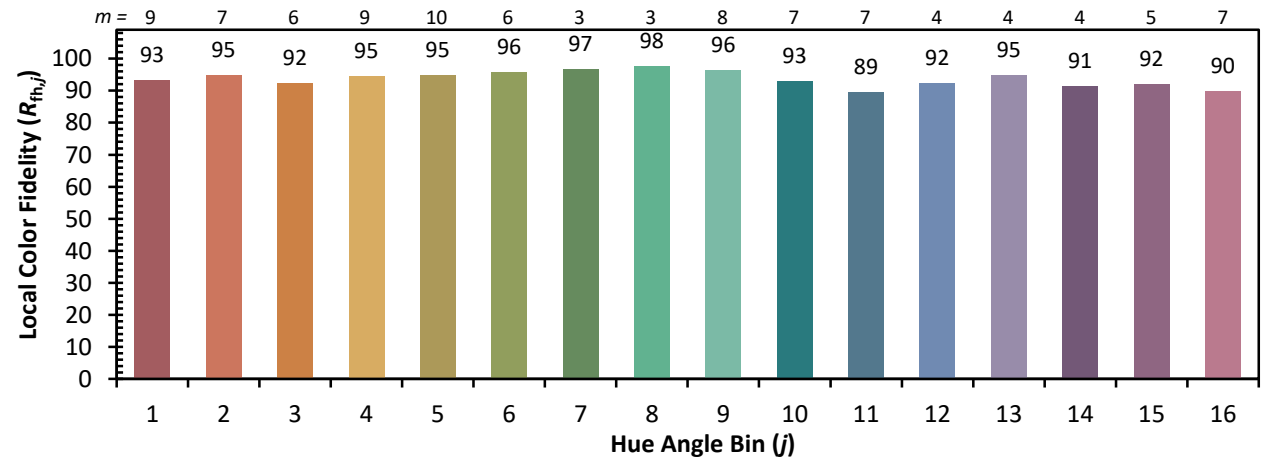
REPORT NUMBER: SP1-2101-124-3

# TM-30-18

## Color Rendition by Hue-Angle Bin



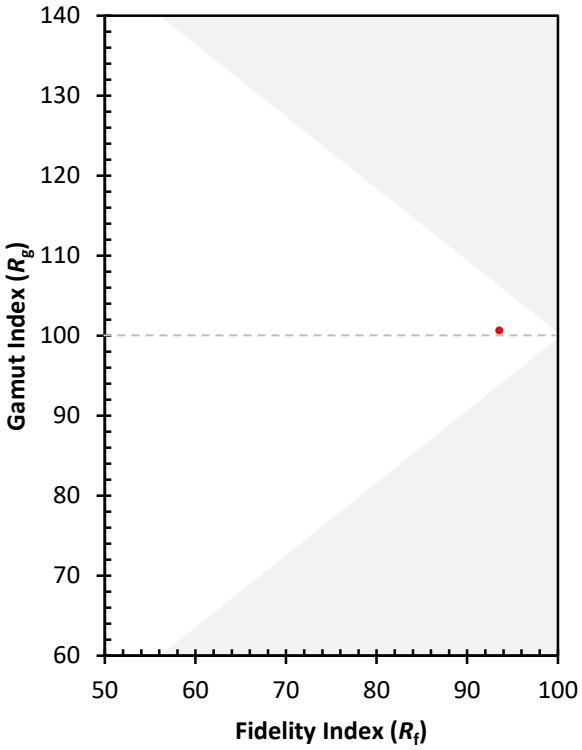



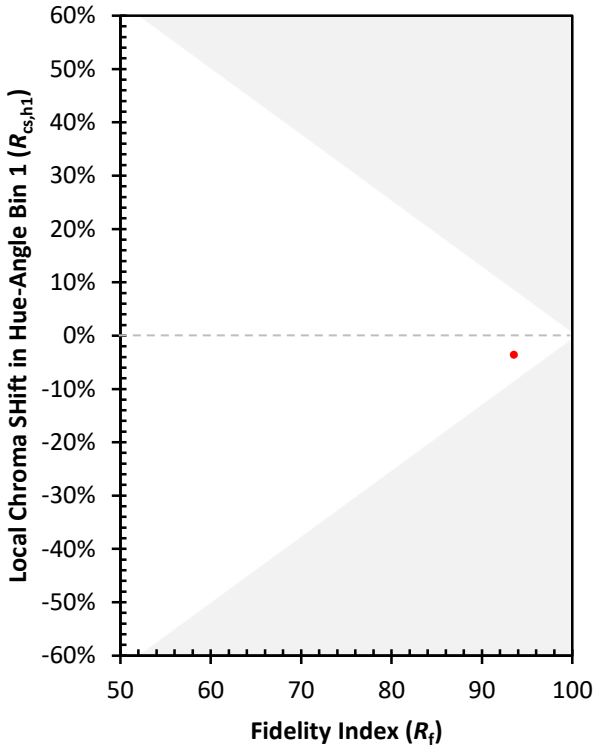



REPORT NUMBER: SP1-2101-124-3

## TM-30-18

### Measure Comparisons




(END OF REPORT)