

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: FAIL-SAFE

Report Number: P733989

Luminaire Tested: **24FCZ2-30-S-B2750-W2D-CA08-4000K**

Issue Date: 1/5/2024



**Test Information**

Test Method: LM-79-08  
Report Number: P733989  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (P272125)  
Test Lab: INNOVATION CENTER(G3)  
Issue Date: 1/5/2024  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: FAIL-SAFE  
Catalog Number: 24FCZ2-30-S-B2750-W2D-CA08-4000K  
Description: 2X4 3000 LUMEN SEALED CRUZE TROFFER WITH BIO UP LEDS AT 4000K CCT  
AND SMOOTH LENS, WITH, CA08 BOTTOM LENS  
  
Light Source: -  
Ballast/Driver: -

**Summary**

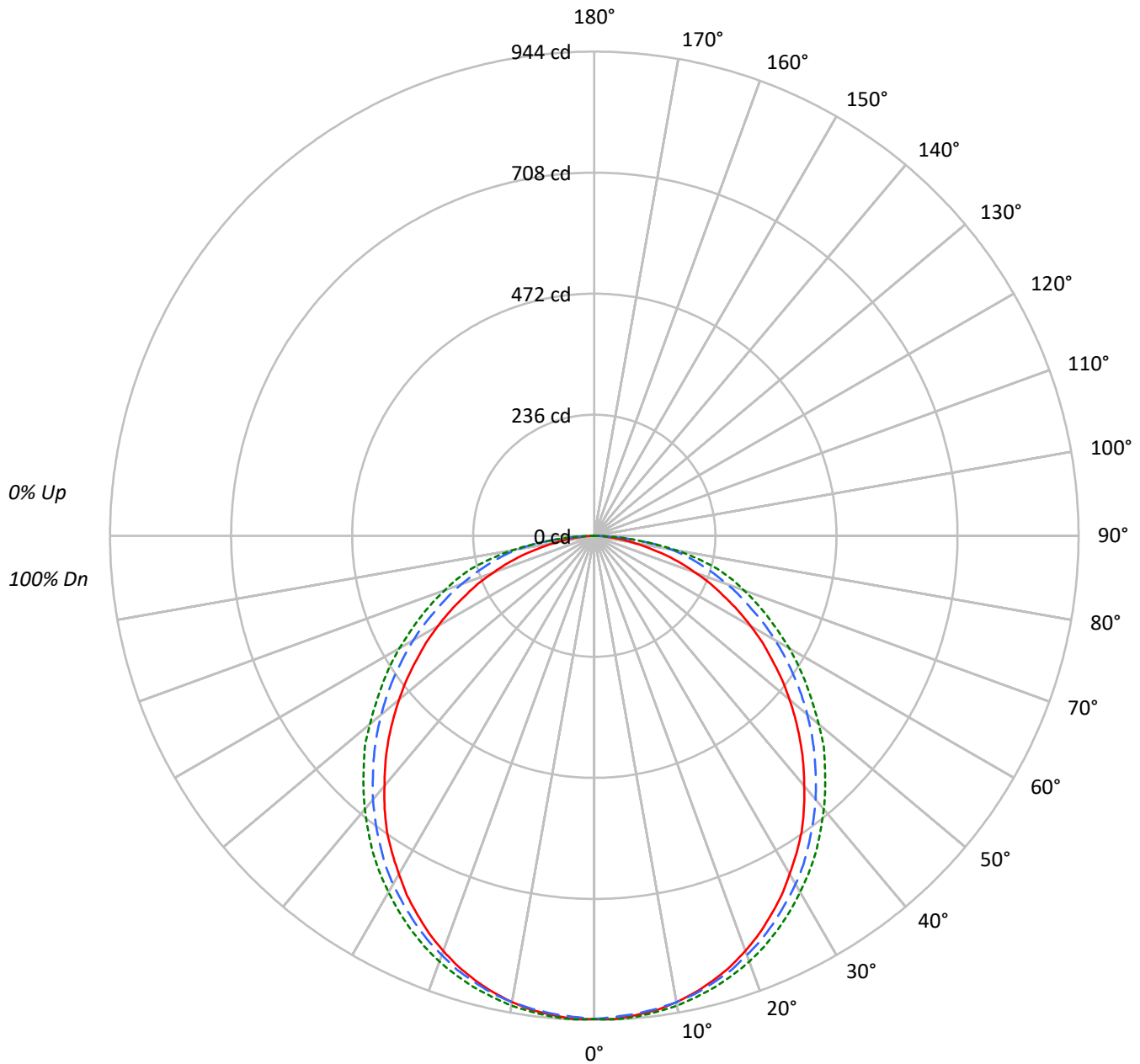
Lumens per Lamp: N/A  
Luminaire Lumens: 2682.0 lumens  
Efficiency: N/A  
Efficacy: 116.6 lumens/watt  
Spacing Criteria (0/90/45): 1.2 / 1.26 / 1.35  
Luminous Opening: Rectangular (W 1.92' x L: 3.98' x H: 0')  
CIE Type: Direct

Input Watts (W): 23  
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

TEST NUMBER: P733989

CATALOG NUMBER: 24FCZ2-30-S-B2750-W2D-CA08-4000K

### Luminous Intensity Polar Plot





TEST NUMBER: P733989

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**COEFFICIENT OF UTILIZATION - ZONAL CAVITY METHOD:**

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|
| RF  | 20  |     |     |     | 20  |     |     |     |     | 20  |     |     |     |     | 20  |     |     |     |    | 20 |
| RC  | 80  |     |     |     | 70  |     |     |     |     | 50  |     |     |     |     | 30  |     |     |     |    | 0  |
| RW  | 70  | 50  | 30  | 10  | 70  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30  | 10  | 50  | 30 | 10 |
| RCR |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |
| 0   | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 | 106 | 106 | 106 | 102 | 102 | 102 | 100 |    |    |
| 1   | 108 | 103 | 99  | 95  | 106 | 101 | 97  | 93  | 97  | 93  | 90  | 93  | 90  | 88  | 89  | 87  | 85  | 83  |    |    |
| 2   | 98  | 90  | 83  | 77  | 96  | 88  | 81  | 76  | 84  | 79  | 74  | 81  | 76  | 72  | 78  | 74  | 71  | 69  |    |    |
| 3   | 89  | 79  | 70  | 64  | 87  | 77  | 69  | 63  | 74  | 67  | 62  | 71  | 66  | 61  | 69  | 64  | 60  | 58  |    |    |
| 4   | 82  | 70  | 61  | 54  | 80  | 68  | 60  | 54  | 66  | 59  | 53  | 63  | 57  | 52  | 61  | 56  | 51  | 49  |    |    |
| 5   | 75  | 62  | 53  | 46  | 73  | 61  | 53  | 46  | 59  | 51  | 46  | 57  | 50  | 45  | 55  | 49  | 45  | 42  |    |    |
| 6   | 70  | 56  | 47  | 40  | 68  | 55  | 47  | 40  | 53  | 46  | 40  | 52  | 45  | 40  | 50  | 44  | 39  | 37  |    |    |
| 7   | 64  | 51  | 42  | 36  | 63  | 50  | 42  | 36  | 48  | 41  | 35  | 47  | 40  | 35  | 46  | 39  | 35  | 33  |    |    |
| 8   | 60  | 46  | 38  | 32  | 58  | 46  | 37  | 32  | 44  | 37  | 32  | 43  | 36  | 31  | 42  | 36  | 31  | 29  |    |    |
| 9   | 56  | 43  | 34  | 29  | 55  | 42  | 34  | 29  | 41  | 34  | 28  | 40  | 33  | 28  | 39  | 33  | 28  | 26  |    |    |
| 10  | 53  | 39  | 31  | 26  | 51  | 39  | 31  | 26  | 38  | 31  | 26  | 37  | 30  | 26  | 36  | 30  | 26  | 24  |    |    |

**AVERAGE LUMINANCE (cd/sqm):**

|     | 0°   | 45°  | 90°  |
|-----|------|------|------|
| 0°  | 1330 | 1330 | 1330 |
| 5°  | 1329 | 1325 | 1334 |
| 10° | 1323 | 1323 | 1333 |
| 15° | 1311 | 1317 | 1331 |
| 20° | 1294 | 1306 | 1327 |
| 25° | 1270 | 1293 | 1319 |
| 30° | 1241 | 1279 | 1308 |
| 35° | 1214 | 1258 | 1298 |
| 40° | 1172 | 1237 | 1282 |
| 45° | 1134 | 1212 | 1269 |
| 50° | 1091 | 1190 | 1253 |
| 55° | 1042 | 1168 | 1241 |
| 60° | 993  | 1149 | 1238 |
| 65° | 930  | 1129 | 1246 |
| 70° | 861  | 1136 | 1280 |
| 75° | 771  | 1157 | 1352 |
| 80° | 623  | 1226 | 1322 |
| 85° | 468  | 1075 | 1049 |



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**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 89.2   | 3.3       |
| 10°-20°   | 254.9  | 9.5       |
| 20°-30°   | 383.1  | 14.3      |
| 30°-40°   | 456.4  | 17.0      |
| 40°-50°   | 467.1  | 17.4      |
| 50°-60°   | 420.5  | 15.7      |
| 60°-70°   | 330.2  | 12.3      |
| 70°-80°   | 214.3  | 8.0       |
| 80°-90°   | 66.3   | 2.5       |
| 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°    | 727.2  | 27.1      |
| 0°-40°    | 1183.6 | 44.1      |
| 0°-60°    | 2071.2 | 77.2      |
| 0°-90°    | 2682.0 | 100.0     |
| 90°-120°  | 0.0    | 0.0       |
| 90°-150°  | 0.0    | 0.0       |
| 90°-180°  | 0.0    | 0.0       |
| 0°-180°   | 2682.0 | 100.0     |

**CANDELA DISTRIBUTION:**

|     | 0°  | 22.5° | 45° | 67.5° | 90° | Flux |
|-----|-----|-------|-----|-------|-----|------|
| 0°  | 942 | 942   | 942 | 942   | 942 |      |
| 5°  | 938 | 940   | 935 | 940   | 941 | 89   |
| 15° | 897 | 900   | 901 | 909   | 911 | 253  |
| 25° | 815 | 822   | 831 | 844   | 847 | 376  |
| 35° | 704 | 713   | 730 | 748   | 753 | 440  |
| 45° | 568 | 582   | 607 | 630   | 636 | 438  |
| 55° | 423 | 442   | 474 | 499   | 504 | 380  |
| 65° | 279 | 300   | 338 | 366   | 373 | 277  |
| 75° | 141 | 169   | 212 | 241   | 248 | 150  |
| 85° | 29  | 54    | 66  | 65    | 65  | 35   |
| 90° | 0   | 0     | 0   | 0     | 0   |      |



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**CANDELA DISTRIBUTION (FULL):**

|       | 0°    | 22.5° | 45°   | 67.5° | 90°   |
|-------|-------|-------|-------|-------|-------|
| 0°    | 942.2 | 942.2 | 942.2 | 942.2 | 942.2 |
| 2.5°  | 943.1 | 943.1 | 938.8 | 943.1 | 943.9 |
| 5°    | 937.9 | 939.7 | 935.4 | 940.5 | 941.3 |
| 7.5°  | 932.8 | 932.8 | 930.2 | 935.4 | 936.3 |
| 10°   | 923.5 | 924.3 | 923.5 | 929.4 | 930.2 |
| 12.5° | 911.6 | 913.2 | 914.1 | 920.1 | 920.9 |
| 15°   | 897.1 | 899.7 | 901.3 | 909.0 | 910.7 |
| 17.5° | 880.9 | 883.4 | 887.6 | 896.2 | 897.9 |
| 20°   | 861.3 | 864.7 | 869.8 | 880.9 | 883.4 |
| 22.5° | 840.0 | 843.4 | 851.9 | 862.1 | 866.4 |
| 25°   | 815.3 | 822.1 | 830.6 | 844.2 | 846.8 |
| 27.5° | 790.5 | 796.5 | 807.6 | 822.1 | 825.5 |
| 30°   | 761.6 | 770.9 | 784.6 | 799.1 | 802.5 |
| 32.5° | 733.5 | 742.8 | 759.0 | 774.4 | 778.6 |
| 35°   | 704.5 | 713.0 | 730.1 | 747.9 | 753.1 |
| 37.5° | 671.3 | 682.4 | 701.1 | 719.0 | 724.1 |
| 40°   | 636.4 | 650.0 | 671.3 | 690.1 | 696.0 |
| 42.5° | 603.1 | 617.6 | 638.9 | 659.4 | 666.1 |
| 45°   | 568.2 | 581.9 | 607.4 | 630.4 | 635.6 |
| 47.5° | 532.4 | 547.8 | 575.0 | 598.0 | 606.5 |
| 50°   | 496.7 | 512.9 | 541.8 | 565.7 | 570.8 |
| 52.5° | 460.9 | 477.9 | 508.6 | 534.1 | 536.7 |
| 55°   | 423.4 | 442.2 | 474.5 | 499.2 | 504.4 |
| 57.5° | 389.3 | 405.5 | 440.4 | 466.0 | 471.9 |
| 60°   | 351.9 | 369.7 | 407.2 | 431.1 | 438.7 |
| 62.5° | 316.0 | 334.8 | 374.0 | 397.8 | 404.6 |
| 65°   | 278.6 | 299.9 | 338.2 | 366.3 | 373.1 |
| 67.5° | 246.2 | 266.7 | 307.5 | 334.8 | 341.6 |
| 70°   | 208.7 | 231.8 | 275.2 | 303.3 | 310.1 |
| 72.5° | 176.3 | 200.2 | 243.7 | 270.9 | 281.1 |
| 75°   | 141.4 | 168.6 | 212.2 | 241.1 | 247.9 |
| 77.5° | 107.4 | 138.9 | 183.1 | 205.3 | 205.3 |
| 80°   | 76.7  | 109.9 | 150.8 | 161.0 | 162.7 |
| 82.5° | 50.3  | 82.6  | 111.6 | 110.8 | 110.8 |
| 85°   | 28.9  | 53.7  | 66.4  | 64.8  | 64.8  |
| 87.5° | 11.1  | 22.2  | 23.8  | 23.8  | 23.0  |
| 90°   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |



Report Generated By 670246072 / DESKTOP-50001EG





— 0°-180°    - - 45°-225°    - - - 90°-270°







LM-79-2019: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

(formerly Eaton)

METALUX

Report Number: SP1-2210-795-4

Test Date: 10/06/2022

Luminaire Tested: 9WP217084MDER4AM-4000K-315MA

Data in this report applies to families of products including 9WP217084MDER4AM-4000K.

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2210-795-4  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/06/2022  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: METALUX  
 Catalog Number: **9WP217084MDER4AM-4000K-315MA**  
 Description: METALUX

TUNABLE BOARD, 4000K-315MA, PROGRAMMED @ 5.0Vdc.

### Spectral Parameters

|                           |         |           |      |      |      |
|---------------------------|---------|-----------|------|------|------|
| CCT (K):                  | 4009    | CRI (Ra): | 87.8 |      |      |
| CIE u':                   | 0.2311  | R1:       | 94.2 | R9:  | 79.5 |
| CIE v':                   | 0.4879  | R2:       | 88.6 | R10: | 77.2 |
| Duv:                      | -0.0109 | R3:       | 84.5 | R11: | 92.9 |
| CIE x:                    | 0.3728  | R4:       | 91.1 | R12: | 72.5 |
| CIE y:                    | 0.3498  | R5:       | 92.1 | R13: | 92.1 |
| CIE z:                    | 0.2775  | R6:       | 82.3 | R14: | 92.6 |
| Peak Wavelength (nm):     | 632     | R7:       | 84.3 |      |      |
| Dominant Wavelength (nm): | 588     | R8:       | 84.9 |      |      |
| Purity:                   | 17.1    |           |      |      |      |
| Rf:                       | 88      |           |      |      |      |
| Rg:                       | 96.2    |           |      |      |      |



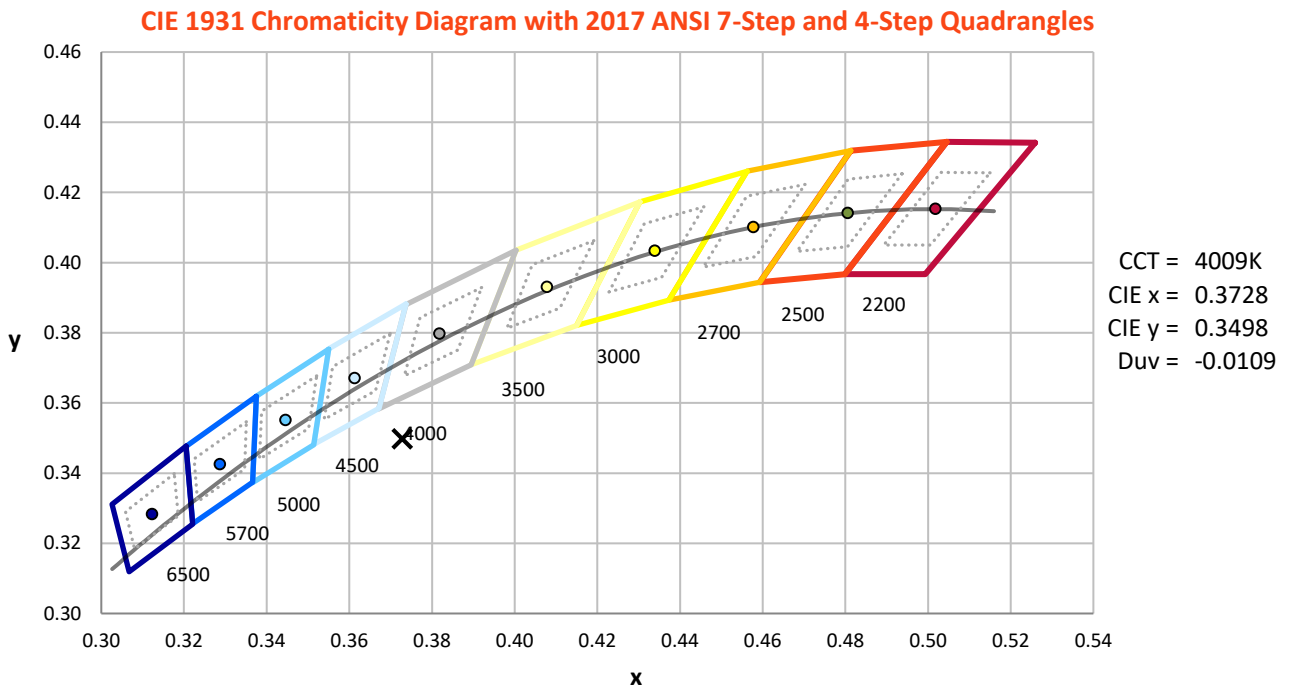
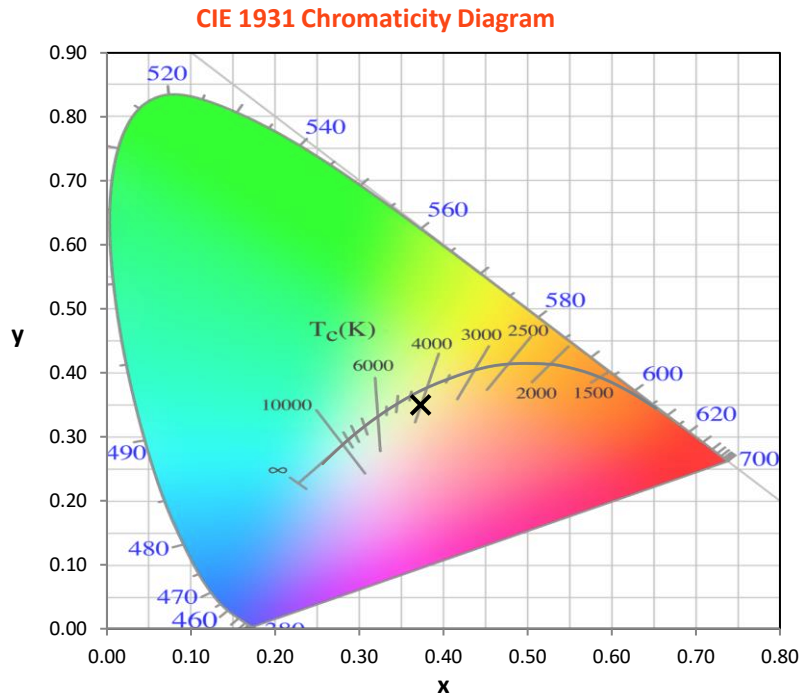
### Test Conditions

Stabilization Time: 44M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.0/38%  
 Sphere Temperature (°C): 24.4

REPORT NUMBER: SP1-2210-795-4

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | 76INCH SPHERE IN0058  | 8/8/2022         | 2/8/2023             |
| Power Meter                    | XITRON 2801 IN0071    | 11/29/2021       | 11/29/2022           |
| AC Power Source                | CHROMA 61603 IN0063   | 11/29/2021       | 11/29/2022           |
| DC Power Source                | AGILENT E3634A IN0208 | 11/29/2021       | 11/29/2022           |
| Sphere Thermometer             | ONSET IN0085          | 11/29/2021       | 11/29/2022           |
| Room Thermometer               | ONSET IN0046          | 11/29/2021       | 11/29/2022           |

REPORT NUMBER: SP1-2210-795-4



Point lies outside the range

REPORT NUMBER: SP1-2210-795-4

**Photopic Flux vs. Wavelength**



#####

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1347             | NR               | 490       | 31353            | NR               | 620       | 38840            | NR               | 750       | 1762             | NR               | 880       | 2493             | NR               |
| 365       | 1168             | NR               | 495       | 28718            | NR               | 625       | 37861            | NR               | 755       | 1752             | NR               | 885       | 1913             | NR               |
| 370       | 1204             | NR               | 500       | 26605            | NR               | 630       | 59547            | NR               | 760       | 1690             | NR               | 890       | 2275             | NR               |
| 375       | 1232             | NR               | 505       | 25784            | NR               | 635       | 49312            | NR               | 765       | 1395             | NR               | 895       | 2173             | NR               |
| 380       | 1249             | NR               | 510       | 25614            | NR               | 640       | 28168            | NR               | 770       | 1452             | NR               | 900       | 1923             | NR               |
| 385       | 1285             | NR               | 515       | 25941            | NR               | 645       | 27115            | NR               | 775       | 1370             | NR               | 905       | 1511             | NR               |
| 390       | 1154             | NR               | 520       | 25900            | NR               | 650       | 24916            | NR               | 780       | 1429             | NR               | 910       | 1971             | NR               |
| 395       | 1036             | NR               | 525       | 26015            | NR               | 655       | 19572            | NR               | 785       | 1112             | NR               | 915       | 1957             | NR               |
| 400       | 873              | NR               | 530       | 26424            | NR               | 660       | 16766            | NR               | 790       | 1222             | NR               | 920       | 1699             | NR               |
| 405       | 908              | NR               | 535       | 26869            | NR               | 665       | 14487            | NR               | 795       | 1347             | NR               | 925       | 2123             | NR               |
| 410       | 1056             | NR               | 540       | 27684            | NR               | 670       | 12943            | NR               | 800       | 1132             | NR               | 930       | 2029             | NR               |
| 415       | 1492             | NR               | 545       | 28407            | NR               | 675       | 11228            | NR               | 805       | 1360             | NR               | 935       | 2371             | NR               |
| 420       | 2426             | NR               | 550       | 29571            | NR               | 680       | 9665             | NR               | 810       | 1451             | NR               | 940       | 1649             | NR               |
| 425       | 4409             | NR               | 555       | 30862            | NR               | 685       | 8389             | NR               | 815       | 1507             | NR               | 945       | 1984             | NR               |
| 430       | 7984             | NR               | 560       | 32297            | NR               | 690       | 7170             | NR               | 820       | 1466             | NR               | 950       | 1495             | NR               |
| 435       | 14687            | NR               | 565       | 33979            | NR               | 695       | 6398             | NR               | 825       | 1609             | NR               | 955       | 1862             | NR               |
| 440       | 26286            | NR               | 570       | 35579            | NR               | 700       | 5544             | NR               | 830       | 1642             | NR               | 960       | 2951             | NR               |
| 445       | 36513            | NR               | 575       | 36922            | NR               | 705       | 4845             | NR               | 835       | 1363             | NR               | 965       | 3240             | NR               |
| 450       | 34274            | NR               | 580       | 38319            | NR               | 710       | 4309             | NR               | 840       | 1294             | NR               | 970       | 3119             | NR               |
| 455       | 27519            | NR               | 585       | 39771            | NR               | 715       | 3879             | NR               | 845       | 1584             | NR               | 975       | 3020             | NR               |
| 460       | 26986            | NR               | 590       | 40329            | NR               | 720       | 3504             | NR               | 850       | 1930             | NR               | 980       | 3800             | NR               |
| 465       | 32511            | NR               | 595       | 40738            | NR               | 725       | 3094             | NR               | 855       | 1952             | NR               | 985       | 3748             | NR               |
| 470       | 41588            | NR               | 600       | 40944            | NR               | 730       | 2758             | NR               | 860       | 1631             | NR               | 990       | 2878             | NR               |
| 475       | 46297            | NR               | 605       | 41826            | NR               | 735       | 2441             | NR               | 865       | 1714             | NR               | 995       | 3708             | NR               |
| 480       | 42885            | NR               | 610       | 48714            | NR               | 740       | 2221             | NR               | 870       | 1878             | NR               | 1000      | 3359             | NR               |
| 485       | 35895            | NR               | 615       | 48984            | NR               | 745       | 2091             | NR               | 875       | 2024             | NR               |           |                  |                  |

REPORT NUMBER: SP1-2210-795-4

**Scotopic Flux vs. Wavelength**



**Scotopic Lumens: 4927.4**

**S/P: 2.02**

| $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) | $\lambda$<br>(nm) | Power<br>( $\mu\text{W/nm}$ ) | Lumens<br>( $\phi/\text{nm}$ ) |
|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|
| 360               | 1347                          | NR                             | 490               | 31353                         | NR                             | 620               | 38840                         | NR                             | 750               | 1762                          | NR                             | 880               | 2493                          | NR                             |
| 365               | 1168                          | NR                             | 495               | 28718                         | NR                             | 625               | 37861                         | NR                             | 755               | 1752                          | NR                             | 885               | 1913                          | NR                             |
| 370               | 1204                          | NR                             | 500               | 26605                         | NR                             | 630               | 59547                         | NR                             | 760               | 1690                          | NR                             | 890               | 2275                          | NR                             |
| 375               | 1232                          | NR                             | 505               | 25784                         | NR                             | 635               | 49312                         | NR                             | 765               | 1395                          | NR                             | 895               | 2173                          | NR                             |
| 380               | 1249                          | NR                             | 510               | 25614                         | NR                             | 640               | 28168                         | NR                             | 770               | 1452                          | NR                             | 900               | 1923                          | NR                             |
| 385               | 1285                          | NR                             | 515               | 25941                         | NR                             | 645               | 27115                         | NR                             | 775               | 1370                          | NR                             | 905               | 1511                          | NR                             |
| 390               | 1154                          | NR                             | 520               | 25900                         | NR                             | 650               | 24916                         | NR                             | 780               | 1429                          | NR                             | 910               | 1971                          | NR                             |
| 395               | 1036                          | NR                             | 525               | 26015                         | NR                             | 655               | 19572                         | NR                             | 785               | 1112                          | NR                             | 915               | 1957                          | NR                             |
| 400               | 873                           | NR                             | 530               | 26424                         | NR                             | 660               | 16766                         | NR                             | 790               | 1222                          | NR                             | 920               | 1699                          | NR                             |
| 405               | 908                           | NR                             | 535               | 26869                         | NR                             | 665               | 14487                         | NR                             | 795               | 1347                          | NR                             | 925               | 2123                          | NR                             |
| 410               | 1056                          | NR                             | 540               | 27684                         | NR                             | 670               | 12943                         | NR                             | 800               | 1132                          | NR                             | 930               | 2029                          | NR                             |
| 415               | 1492                          | NR                             | 545               | 28407                         | NR                             | 675               | 11228                         | NR                             | 805               | 1360                          | NR                             | 935               | 2371                          | NR                             |
| 420               | 2426                          | NR                             | 550               | 29571                         | NR                             | 680               | 9665                          | NR                             | 810               | 1451                          | NR                             | 940               | 1649                          | NR                             |
| 425               | 4409                          | NR                             | 555               | 30862                         | NR                             | 685               | 8389                          | NR                             | 815               | 1507                          | NR                             | 945               | 1984                          | NR                             |
| 430               | 7984                          | NR                             | 560               | 32297                         | NR                             | 690               | 7170                          | NR                             | 820               | 1466                          | NR                             | 950               | 1495                          | NR                             |
| 435               | 14687                         | NR                             | 565               | 33979                         | NR                             | 695               | 6398                          | NR                             | 825               | 1609                          | NR                             | 955               | 1862                          | NR                             |
| 440               | 26286                         | NR                             | 570               | 35579                         | NR                             | 700               | 5544                          | NR                             | 830               | 1642                          | NR                             | 960               | 2951                          | NR                             |
| 445               | 36513                         | NR                             | 575               | 36922                         | NR                             | 705               | 4845                          | NR                             | 835               | 1363                          | NR                             | 965               | 3240                          | NR                             |
| 450               | 34274                         | NR                             | 580               | 38319                         | NR                             | 710               | 4309                          | NR                             | 840               | 1294                          | NR                             | 970               | 3119                          | NR                             |
| 455               | 27519                         | NR                             | 585               | 39771                         | NR                             | 715               | 3879                          | NR                             | 845               | 1584                          | NR                             | 975               | 3020                          | NR                             |
| 460               | 26986                         | NR                             | 590               | 40329                         | NR                             | 720               | 3504                          | NR                             | 850               | 1930                          | NR                             | 980               | 3800                          | NR                             |
| 465               | 32511                         | NR                             | 595               | 40738                         | NR                             | 725               | 3094                          | NR                             | 855               | 1952                          | NR                             | 985               | 3748                          | NR                             |
| 470               | 41588                         | NR                             | 600               | 40944                         | NR                             | 730               | 2758                          | NR                             | 860               | 1631                          | NR                             | 990               | 2878                          | NR                             |
| 475               | 46297                         | NR                             | 605               | 41826                         | NR                             | 735               | 2441                          | NR                             | 865               | 1714                          | NR                             | 995               | 3708                          | NR                             |
| 480               | 42885                         | NR                             | 610               | 48714                         | NR                             | 740               | 2221                          | NR                             | 870               | 1878                          | NR                             | 1000              | 3359                          | NR                             |
| 485               | 35895                         | NR                             | 615               | 48984                         | NR                             | 745               | 2091                          | NR                             | 875               | 2024                          | NR                             |                   |                               |                                |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 2189.1**

**S/P: 0.9**

| λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) | λ<br>(nm) | Power<br>(μW/nm) | Lumens<br>(φ/nm) |
|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|-----------|------------------|------------------|
| 360       | 1347             | NR               | 490       | 31353            | NR               | 620       | 38840            | NR               | 750       | 1762             | NR               | 880       | 2493             | NR               |
| 365       | 1168             | NR               | 495       | 28718            | NR               | 625       | 37861            | NR               | 755       | 1752             | NR               | 885       | 1913             | NR               |
| 370       | 1204             | NR               | 500       | 26605            | NR               | 630       | 59547            | NR               | 760       | 1690             | NR               | 890       | 2275             | NR               |
| 375       | 1232             | NR               | 505       | 25784            | NR               | 635       | 49312            | NR               | 765       | 1395             | NR               | 895       | 2173             | NR               |
| 380       | 1249             | NR               | 510       | 25614            | NR               | 640       | 28168            | NR               | 770       | 1452             | NR               | 900       | 1923             | NR               |
| 385       | 1285             | NR               | 515       | 25941            | NR               | 645       | 27115            | NR               | 775       | 1370             | NR               | 905       | 1511             | NR               |
| 390       | 1154             | NR               | 520       | 25900            | NR               | 650       | 24916            | NR               | 780       | 1429             | NR               | 910       | 1971             | NR               |
| 395       | 1036             | NR               | 525       | 26015            | NR               | 655       | 19572            | NR               | 785       | 1112             | NR               | 915       | 1957             | NR               |
| 400       | 873              | NR               | 530       | 26424            | NR               | 660       | 16766            | NR               | 790       | 1222             | NR               | 920       | 1699             | NR               |
| 405       | 908              | NR               | 535       | 26869            | NR               | 665       | 14487            | NR               | 795       | 1347             | NR               | 925       | 2123             | NR               |
| 410       | 1056             | NR               | 540       | 27684            | NR               | 670       | 12943            | NR               | 800       | 1132             | NR               | 930       | 2029             | NR               |
| 415       | 1492             | NR               | 545       | 28407            | NR               | 675       | 11228            | NR               | 805       | 1360             | NR               | 935       | 2371             | NR               |
| 420       | 2426             | NR               | 550       | 29571            | NR               | 680       | 9665             | NR               | 810       | 1451             | NR               | 940       | 1649             | NR               |
| 425       | 4409             | NR               | 555       | 30862            | NR               | 685       | 8389             | NR               | 815       | 1507             | NR               | 945       | 1984             | NR               |
| 430       | 7984             | NR               | 560       | 32297            | NR               | 690       | 7170             | NR               | 820       | 1466             | NR               | 950       | 1495             | NR               |
| 435       | 14687            | NR               | 565       | 33979            | NR               | 695       | 6398             | NR               | 825       | 1609             | NR               | 955       | 1862             | NR               |
| 440       | 26286            | NR               | 570       | 35579            | NR               | 700       | 5544             | NR               | 830       | 1642             | NR               | 960       | 2951             | NR               |
| 445       | 36513            | NR               | 575       | 36922            | NR               | 705       | 4845             | NR               | 835       | 1363             | NR               | 965       | 3240             | NR               |
| 450       | 34274            | NR               | 580       | 38319            | NR               | 710       | 4309             | NR               | 840       | 1294             | NR               | 970       | 3119             | NR               |
| 455       | 27519            | NR               | 585       | 39771            | NR               | 715       | 3879             | NR               | 845       | 1584             | NR               | 975       | 3020             | NR               |
| 460       | 26986            | NR               | 590       | 40329            | NR               | 720       | 3504             | NR               | 850       | 1930             | NR               | 980       | 3800             | NR               |
| 465       | 32511            | NR               | 595       | 40738            | NR               | 725       | 3094             | NR               | 855       | 1952             | NR               | 985       | 3748             | NR               |
| 470       | 41588            | NR               | 600       | 40944            | NR               | 730       | 2758             | NR               | 860       | 1631             | NR               | 990       | 2878             | NR               |
| 475       | 46297            | NR               | 605       | 41826            | NR               | 735       | 2441             | NR               | 865       | 1714             | NR               | 995       | 3708             | NR               |
| 480       | 42885            | NR               | 610       | 48714            | NR               | 740       | 2221             | NR               | 870       | 1878             | NR               | 1000      | 3359             | NR               |
| 485       | 35895            | NR               | 615       | 48984            | NR               | 745       | 2091             | NR               | 875       | 2024             | NR               |           |                  |                  |

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### Summary

$R_f = 88$   
 $R_g = 96.2$   
 CIE  $R_a = 87.8$   
 $R_g = 79.5$



### Color Vector Graphics



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

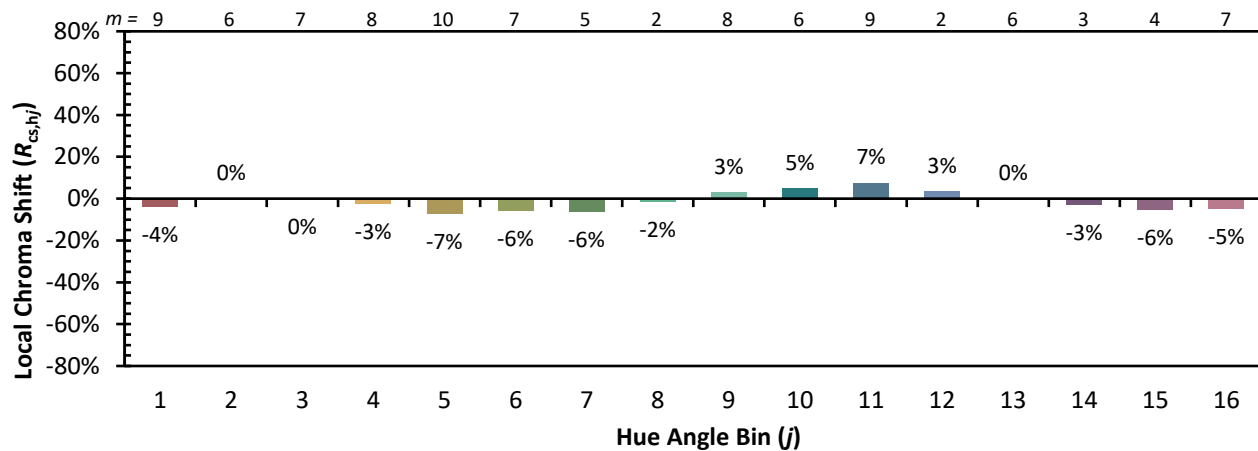
|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 91 | CES51 = 88 | CES76 = 86 |
| CES02 = 62 | CES27 = 85 | CES52 = 91 | CES77 = 79 |
| CES03 = 31 | CES28 = 93 | CES53 = 85 | CES78 = 87 |
| CES04 = 70 | CES29 = 84 | CES54 = 86 | CES79 = 81 |
| CES05 = 49 | CES30 = 81 | CES55 = 84 | CES80 = 82 |
| CES06 = 51 | CES31 = 85 | CES56 = 83 | CES81 = 65 |
| CES07 = 42 | CES32 = 92 | CES57 = 81 | CES82 = 93 |
| CES08 = 41 | CES33 = 86 | CES58 = 82 | CES83 = 87 |
| CES09 = 29 | CES34 = 90 | CES59 = 93 | CES84 = 96 |
| CES10 = 75 | CES35 = 94 | CES60 = 90 | CES85 = 77 |
| CES11 = 58 | CES36 = 78 | CES61 = 89 | CES86 = 74 |
| CES12 = 64 | CES37 = 92 | CES62 = 80 | CES87 = 89 |
| CES13 = 43 | CES38 = 77 | CES63 = 92 | CES88 = 89 |
| CES14 = 74 | CES39 = 95 | CES64 = 86 | CES89 = 84 |
| CES15 = 71 | CES40 = 91 | CES65 = 91 | CES90 = 87 |
| CES16 = 47 | CES41 = 90 | CES66 = 87 | CES91 = 74 |
| CES17 = 49 | CES42 = 87 | CES67 = 88 | CES92 = 77 |
| CES18 = 56 | CES43 = 86 | CES68 = 90 | CES93 = 86 |
| CES19 = 71 | CES44 = 99 | CES69 = 91 | CES94 = 78 |
| CES20 = 66 | CES45 = 89 | CES70 = 91 | CES95 = 86 |
| CES21 = 85 | CES46 = 90 | CES71 = 86 | CES96 = 94 |
| CES22 = 78 | CES47 = 84 | CES72 = 95 | CES97 = 88 |
| CES23 = 91 | CES48 = 80 | CES73 = 89 | CES98 = 87 |
| CES24 = 90 | CES49 = 90 | CES74 = 88 | CES99 = 88 |
| CES25 = 71 | CES50 = 89 | CES75 = 86 |            |



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Color Rendition by Hue-Angle Bin



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**Measure Comparisons**



(END OF REPORT)