

Signify Classified - Internal  
Cooper Lighting Solutions Photometric Lab  
1121 Highway 74 South  
Peachtree City, GA 30269



Scaled data based on original data using  
LM-79-2019 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for

Cooper Lighting Solutions

Brand: STREETWORKS

Report Number: P359237

Luminaire Tested: NVN-SA1A-740-U-T2

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-2019  
Report Number: P359237  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-12)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS  
Product Line: STREETWORKS  
Catalog Number: NVN-SA1A-740-U-T2  
Description: NAVION ROADWAY AND AREA LUMINAIRE  
(1) 70 CRI, 4000K, 615mA LIGHTSQUARE WITH 16 LEDS AND TYPE II OPTICS  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 4681 lumens  
Efficiency: N/A  
Efficacy: 137.7 lumens/watt  
Luminous Opening: Rectangular (W 0.5' x L: 0.5' x H: 0')  
IES Classification: Type III - Medium  
BUG Rating: B1 - U0 - G1

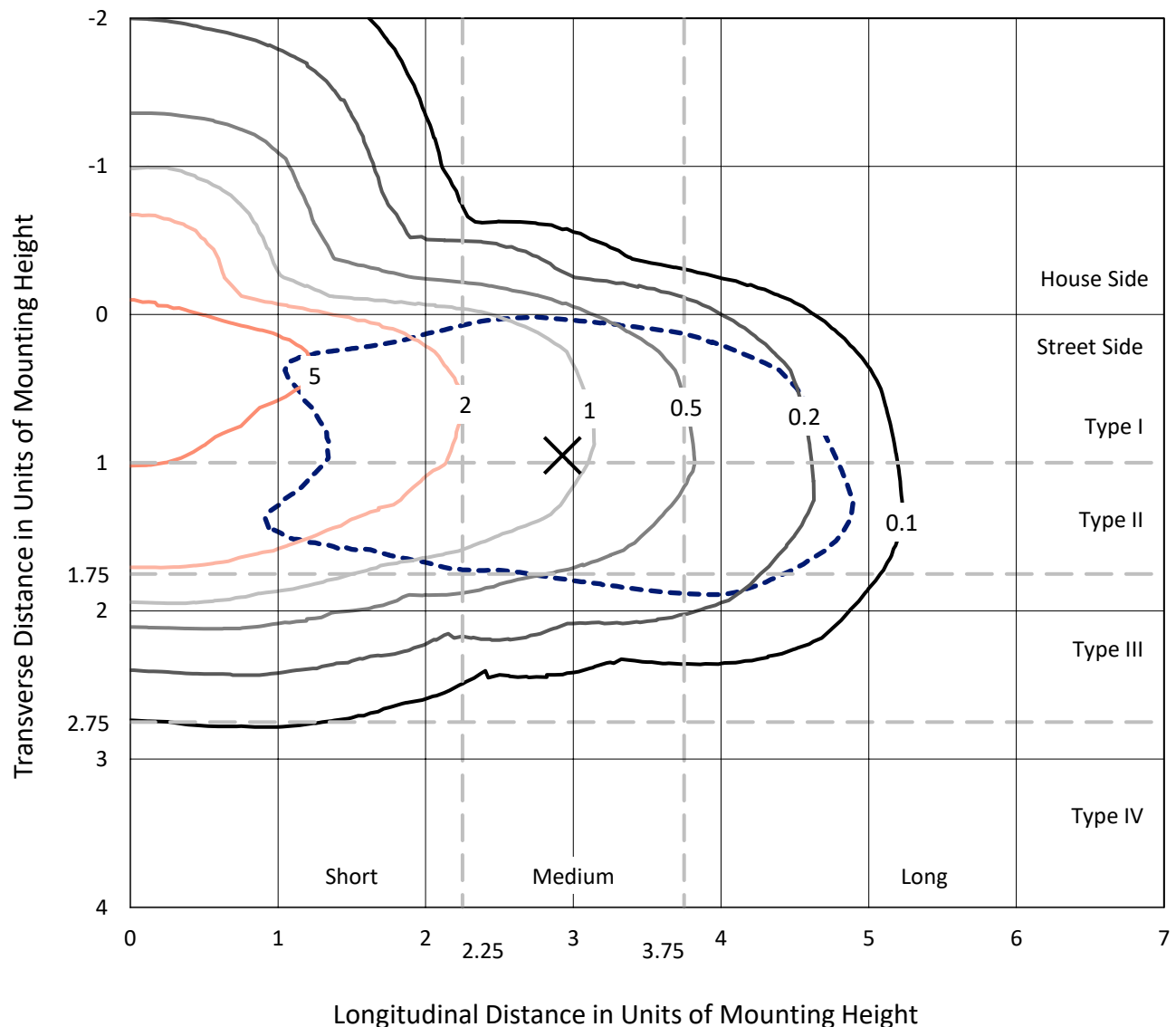
Input Watts (W): 34  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 28.75 FT



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## Iso-Footcandle Lines of Horizontal Illumination

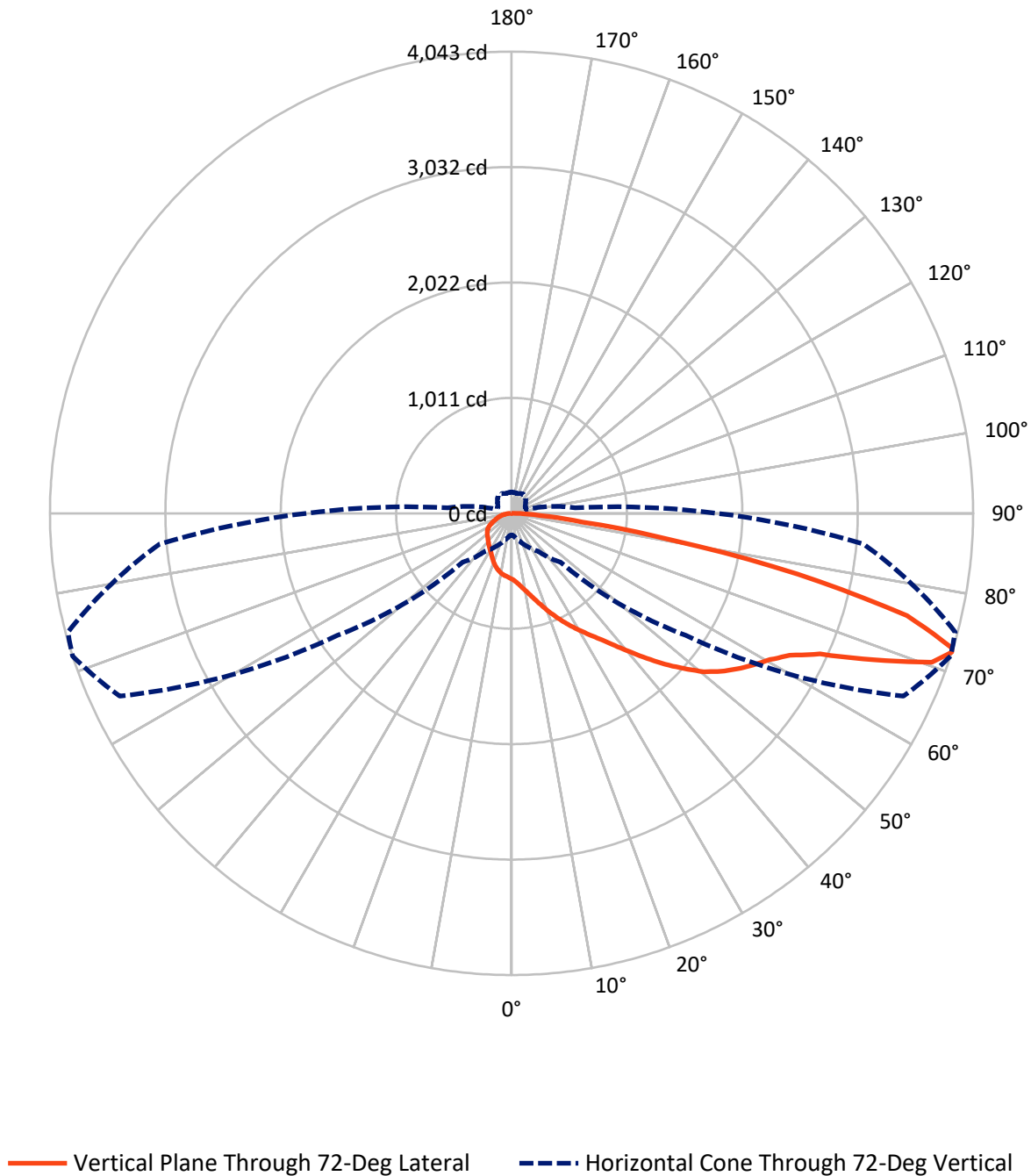
× Max cd  
 - - - 1/2 Max cd



Based on 10 foot mounting height. Maximum calculated value = 8 fc  
 Type III - Medium - N/A

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## Luminous Intensity Polar Plot



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CATALOG NUMBER: NVN-SA1A-740-U-T2

**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total  |
|--------------------|-----------|----------|--------|--------|
| <b>House Side</b>  | Lumens    | 868.4    | 0.0    | 868.4  |
|                    | % Fixture | 18.6     | 0.0    | 18.6   |
| <b>Street Side</b> | Lumens    | 3812.6   | 0.0    | 3812.6 |
|                    | % Fixture | 81.4     | 0.0    | 81.4   |
| <b>Total</b>       | Lumens    | 4681.0   | 0.0    | 4681.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0  |

**ZONAL LUMENS:**

| Zone      | Lumens | % Fixture |
|-----------|--------|-----------|
| 0°-10°    | 57.7   | 1.2       |
| 10°-20°   | 186.5  | 4.0       |
| 20°-30°   | 326.8  | 7.0       |
| 30°-40°   | 484.5  | 10.4      |
| 40°-50°   | 708.6  | 15.1      |
| 50°-60°   | 975.0  | 20.8      |
| 60°-70°   | 1085.5 | 23.2      |
| 70°-80°   | 735.5  | 15.7      |
| 80°-90°   | 120.9  | 2.6       |
| 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°-90°    | 4681.0 | 100.0     |
| 0°-180°   | 4681.0 | 100.0     |

**Coefficient of Utilization**



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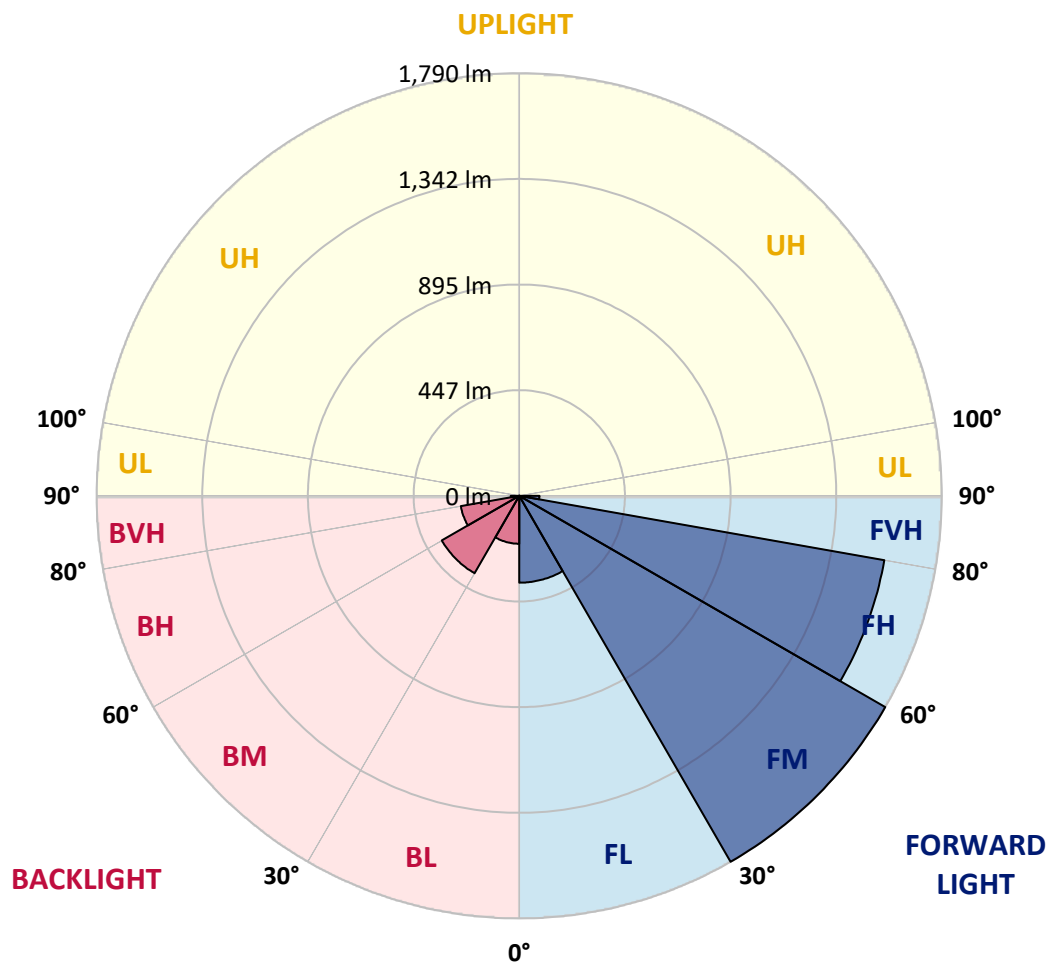
CATALOG NUMBER: NVN-SA1A-740-U-T2

**LUMINAIRE CLASSIFICATION SYSTEM LUMEN TABLE AND BUG RATING:**

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |         |
|------|-------------|--------|-----------|-------------------------|------|---------|
|      |             |        |           | B                       | U    | G       |
| FL   | (0°-30°)    | 368.0  | 7.9       |                         |      |         |
| FM   | (30°-60°)   | 1789.6 | 38.2      |                         |      |         |
| FH   | (60°-80°)   | 1569.8 | 33.5      |                         |      | G1/1800 |
| FVH  | (80°-90°)   | 85.3   | 1.8       |                         |      | G1/100  |
| BL   | (0°-30°)    | 203.0  | 4.3       | B1/500                  |      |         |
| BM   | (30°-60°)   | 378.5  | 8.1       | B1/1000                 |      |         |
| BH   | (60°-80°)   | 251.2  | 5.4       | B1/500                  |      | G1/500  |
| BVH  | (80°-90°)   | 35.6   | 0.8       |                         |      | G1/100  |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |         |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |         |

**BUG Rating: B1-U0-G1**

Type III Medium





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**CANDELA DISTRIBUTION (FULL):**

|       | 0°     | 5°     | 15°    | 25°    | 35°    | 45°    | 55°    | 65°    | 72°    | 75°    | 85°    |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 575.9  | 575.9  | 575.9  | 575.9  | 575.9  | 575.9  | 575.9  | 575.9  | 575.9  | 575.9  | 575.9  |
| 2.5°  | 636.2  | 635.2  | 631.8  | 631.8  | 625.4  | 619.9  | 609.6  | 602.6  | 594.4  | 591.5  | 581.8  |
| 5°    | 697.7  | 698.1  | 693.9  | 691.0  | 681.5  | 669.9  | 652.3  | 636.3  | 620.4  | 613.9  | 594.1  |
| 7.5°  | 749.5  | 748.8  | 747.7  | 745.3  | 736.4  | 724.5  | 700.8  | 677.1  | 653.6  | 643.9  | 609.7  |
| 10°   | 782.7  | 784.1  | 785.1  | 786.2  | 782.5  | 774.0  | 751.6  | 722.7  | 691.9  | 678.7  | 628.4  |
| 12.5° | 799.4  | 802.0  | 806.5  | 814.3  | 820.4  | 819.4  | 803.1  | 772.5  | 735.9  | 719.3  | 651.8  |
| 15°   | 809.3  | 812.7  | 819.7  | 833.6  | 850.9  | 860.7  | 856.3  | 828.6  | 787.8  | 767.4  | 680.3  |
| 17.5° | 815.4  | 818.1  | 829.1  | 847.6  | 873.3  | 899.4  | 910.8  | 887.6  | 846.5  | 823.1  | 713.0  |
| 20°   | 819.6  | 821.7  | 835.4  | 857.1  | 890.3  | 931.9  | 963.8  | 958.0  | 911.1  | 880.8  | 747.2  |
| 22.5° | 828.9  | 830.7  | 843.8  | 865.7  | 902.4  | 956.1  | 1014.9 | 1023.6 | 979.3  | 945.0  | 783.8  |
| 25°   | 855.0  | 855.0  | 866.0  | 881.3  | 915.8  | 977.1  | 1058.1 | 1096.6 | 1048.9 | 1009.0 | 817.7  |
| 27.5° | 904.8  | 904.4  | 908.4  | 913.7  | 939.8  | 998.3  | 1096.6 | 1161.1 | 1121.1 | 1077.5 | 850.5  |
| 30°   | 963.8  | 967.1  | 967.5  | 965.0  | 977.2  | 1024.9 | 1132.3 | 1229.1 | 1193.8 | 1146.8 | 884.2  |
| 32.5° | 1039.8 | 1041.8 | 1039.4 | 1030.9 | 1029.1 | 1062.6 | 1167.2 | 1300.4 | 1272.5 | 1219.1 | 915.0  |
| 35°   | 1136.1 | 1132.1 | 1124.5 | 1107.1 | 1090.5 | 1113.1 | 1207.2 | 1371.6 | 1360.8 | 1306.7 | 957.4  |
| 37.5° | 1239.5 | 1239.6 | 1230.3 | 1190.8 | 1167.9 | 1177.6 | 1262.3 | 1452.4 | 1467.7 | 1410.8 | 1011.7 |
| 40°   | 1322.3 | 1326.6 | 1332.4 | 1280.6 | 1250.9 | 1264.3 | 1332.4 | 1546.0 | 1594.0 | 1534.2 | 1082.5 |
| 42.5° | 1380.2 | 1385.2 | 1401.6 | 1369.0 | 1338.3 | 1363.1 | 1415.0 | 1645.9 | 1735.9 | 1676.7 | 1165.3 |
| 45°   | 1441.4 | 1444.1 | 1455.7 | 1441.7 | 1422.1 | 1478.0 | 1508.0 | 1749.4 | 1885.9 | 1828.6 | 1258.0 |
| 47.5° | 1505.9 | 1508.8 | 1520.7 | 1511.4 | 1501.0 | 1585.3 | 1605.0 | 1846.9 | 2029.7 | 1995.4 | 1356.9 |
| 50°   | 1585.5 | 1587.4 | 1598.7 | 1581.8 | 1585.0 | 1666.2 | 1691.7 | 1936.4 | 2180.4 | 2145.3 | 1456.2 |
| 52.5° | 1694.1 | 1694.6 | 1710.2 | 1694.9 | 1679.8 | 1725.6 | 1766.3 | 2020.7 | 2298.5 | 2281.9 | 1555.5 |
| 55°   | 1779.2 | 1784.4 | 1835.6 | 1832.4 | 1823.7 | 1779.4 | 1828.7 | 2100.9 | 2404.0 | 2411.9 | 1660.9 |
| 57.5° | 1724.9 | 1745.1 | 1848.9 | 1922.0 | 1993.3 | 1913.3 | 1913.0 | 2191.4 | 2501.9 | 2539.3 | 1776.8 |
| 60°   | 1510.7 | 1538.1 | 1691.1 | 1853.4 | 2076.3 | 2146.4 | 2088.0 | 2301.8 | 2600.9 | 2665.7 | 1922.0 |
| 62.5° | 1078.9 | 1124.0 | 1331.3 | 1590.5 | 1962.5 | 2300.8 | 2444.2 | 2477.0 | 2735.5 | 2812.1 | 2110.8 |
| 65°   | 545.4  | 579.6  | 753.3  | 1065.5 | 1567.9 | 2199.9 | 2831.4 | 2860.6 | 2969.4 | 3037.4 | 2401.4 |
| 67.5° | 331.4  | 344.3  | 429.1  | 592.6  | 961.3  | 1713.6 | 2957.8 | 3500.0 | 3421.9 | 3458.1 | 2815.8 |
| 70°   | 244.2  | 253.7  | 306.6  | 393.6  | 552.8  | 1005.6 | 2570.0 | 3956.2 | 3905.0 | 3901.0 | 3122.0 |
| 72°   | 190.2  | 197.1  | 243.9  | 318.0  | 404.2  | 603.3  | 1862.7 | 3787.8 | 4043.3 | 4023.0 | 3094.0 |
| 72.5° | 180.4  | 186.5  | 229.0  | 299.3  | 382.0  | 546.9  | 1674.8 | 3674.2 | 4033.3 | 4024.1 | 3057.7 |
| 75°   | 142.0  | 146.3  | 169.6  | 231.5  | 299.0  | 310.3  | 917.7  | 2847.4 | 3578.0 | 3726.7 | 2750.2 |
| 77.5° | 117.5  | 118.1  | 130.4  | 168.4  | 233.1  | 219.4  | 450.8  | 1975.5 | 2562.1 | 2725.7 | 1948.1 |
| 80°   | 95.7   | 96.5   | 102.3  | 118.1  | 176.3  | 162.3  | 214.0  | 1136.0 | 1434.5 | 1436.2 | 926.4  |
| 82.5° | 76.2   | 76.4   | 82.8   | 86.4   | 126.7  | 116.0  | 122.7  | 533.3  | 626.8  | 603.0  | 333.0  |
| 85°   | 53.7   | 52.5   | 80.9   | 70.9   | 82.8   | 74.5   | 67.7   | 211.1  | 259.2  | 247.9  | 104.3  |
| 87.5° | 17.9   | 18.5   | 35.9   | 45.9   | 48.4   | 42.2   | 30.1   | 80.9   | 97.8   | 97.0   | 33.0   |
| 90°   | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |



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CATALOG NUMBER: NVN-SA1A-740-U-T2

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°   | 105°  | 115°  | 125°  | 135°  | 145°  | 155°  | 165°  | 175°  | 180°  |
|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0°    | 575.9  | 575.9 | 575.9 | 575.9 | 575.9 | 575.9 | 575.9 | 575.9 | 575.9 | 575.9 | 575.9 |
| 2.5°  | 578.8  | 573.6 | 566.1 | 557.7 | 551.1 | 544.3 | 539.3 | 536.7 | 533.8 | 531.4 | 534.3 |
| 5°    | 584.9  | 575.2 | 559.1 | 543.3 | 531.7 | 521.4 | 514.0 | 510.1 | 506.6 | 504.2 | 504.5 |
| 7.5°  | 594.9  | 579.3 | 552.2 | 529.1 | 513.0 | 501.9 | 494.3 | 491.8 | 489.5 | 488.8 | 489.7 |
| 10°   | 605.5  | 582.5 | 543.0 | 512.4 | 494.0 | 484.8 | 481.4 | 483.2 | 484.8 | 486.3 | 487.9 |
| 12.5° | 617.6  | 585.4 | 529.6 | 492.7 | 477.1 | 473.5 | 476.9 | 484.7 | 490.3 | 493.7 | 495.8 |
| 15°   | 633.4  | 588.0 | 514.2 | 473.1 | 462.6 | 466.6 | 478.1 | 491.4 | 501.3 | 507.5 | 508.5 |
| 17.5° | 647.9  | 587.8 | 494.3 | 453.2 | 450.8 | 462.6 | 479.8 | 498.7 | 511.9 | 520.8 | 522.5 |
| 20°   | 662.9  | 583.5 | 471.3 | 433.9 | 438.9 | 458.2 | 480.6 | 503.4 | 519.3 | 529.6 | 532.0 |
| 22.5° | 676.9  | 575.9 | 446.0 | 416.3 | 428.9 | 452.4 | 477.6 | 500.6 | 516.6 | 525.0 | 527.5 |
| 25°   | 686.5  | 562.7 | 420.3 | 401.5 | 420.0 | 445.3 | 467.6 | 486.1 | 498.0 | 502.2 | 502.9 |
| 27.5° | 691.3  | 545.4 | 396.2 | 388.6 | 410.8 | 433.7 | 449.0 | 458.2 | 461.6 | 461.3 | 460.6 |
| 30°   | 691.9  | 522.7 | 375.4 | 378.1 | 400.2 | 416.6 | 423.9 | 422.1 | 417.8 | 410.4 | 411.0 |
| 32.5° | 689.8  | 497.1 | 358.0 | 368.1 | 386.7 | 395.9 | 396.2 | 387.6 | 376.0 | 364.3 | 361.0 |
| 35°   | 690.5  | 471.9 | 342.7 | 356.8 | 370.2 | 374.3 | 370.5 | 358.0 | 342.2 | 327.0 | 323.8 |
| 37.5° | 697.6  | 450.0 | 329.4 | 343.8 | 352.0 | 353.0 | 347.7 | 334.4 | 322.8 | 308.0 | 306.7 |
| 40°   | 714.5  | 434.4 | 316.9 | 329.1 | 333.8 | 334.3 | 326.7 | 317.4 | 318.3 | 310.4 | 310.3 |
| 42.5° | 745.0  | 427.6 | 305.8 | 313.8 | 316.7 | 317.7 | 311.9 | 305.9 | 314.3 | 309.1 | 307.4 |
| 45°   | 784.3  | 429.2 | 296.4 | 298.8 | 304.1 | 308.7 | 305.1 | 297.9 | 301.1 | 278.7 | 271.3 |
| 47.5° | 829.7  | 439.5 | 289.0 | 285.9 | 295.1 | 303.7 | 298.2 | 287.2 | 275.8 | 253.5 | 249.3 |
| 50°   | 882.9  | 455.5 | 282.2 | 273.2 | 285.3 | 296.9 | 291.4 | 275.8 | 258.5 | 247.7 | 246.3 |
| 52.5° | 938.4  | 475.0 | 275.5 | 259.2 | 272.9 | 291.7 | 289.0 | 273.2 | 251.9 | 241.3 | 239.3 |
| 55°   | 1001.2 | 494.7 | 266.9 | 242.9 | 259.5 | 289.3 | 287.9 | 263.8 | 246.9 | 241.0 | 239.5 |
| 57.5° | 1079.4 | 517.1 | 255.6 | 226.0 | 246.9 | 280.6 | 276.1 | 258.2 | 241.8 | 237.3 | 236.8 |
| 60°   | 1181.3 | 550.1 | 239.3 | 207.9 | 231.6 | 267.2 | 266.3 | 250.0 | 233.5 | 230.3 | 229.7 |
| 62.5° | 1334.1 | 604.7 | 216.9 | 189.9 | 214.5 | 244.5 | 253.4 | 238.9 | 224.8 | 224.7 | 225.0 |
| 65°   | 1571.0 | 686.9 | 192.6 | 174.1 | 197.3 | 225.3 | 238.4 | 227.4 | 216.0 | 219.2 | 219.7 |
| 67.5° | 1845.6 | 755.1 | 168.8 | 158.6 | 179.7 | 207.1 | 224.8 | 216.0 | 204.2 | 212.6 | 212.8 |
| 70°   | 1937.0 | 694.2 | 147.8 | 143.3 | 161.5 | 189.5 | 210.2 | 203.4 | 191.5 | 199.9 | 199.1 |
| 72°   | 1802.6 | 560.4 | 134.3 | 131.7 | 147.8 | 175.0 | 197.1 | 191.6 | 179.9 | 185.5 | 183.4 |
| 72.5° | 1760.2 | 534.3 | 130.9 | 128.8 | 144.1 | 171.3 | 193.7 | 188.7 | 177.0 | 181.8 | 179.9 |
| 75°   | 1570.2 | 464.0 | 112.5 | 113.0 | 125.7 | 153.3 | 174.7 | 173.1 | 161.0 | 161.5 | 160.9 |
| 77.5° | 1138.9 | 340.2 | 94.8  | 98.0  | 107.0 | 134.7 | 155.5 | 154.6 | 141.4 | 138.9 | 138.5 |
| 80°   | 528.5  | 173.6 | 77.2  | 78.7  | 88.0  | 112.7 | 132.6 | 131.4 | 120.7 | 117.7 | 115.9 |
| 82.5° | 181.0  | 82.5  | 58.0  | 59.0  | 68.2  | 90.7  | 115.1 | 114.3 | 105.4 | 99.4  | 95.7  |
| 85°   | 64.6   | 41.1  | 40.6  | 39.6  | 48.7  | 71.4  | 100.3 | 95.9  | 82.8  | 70.6  | 70.3  |
| 87.5° | 21.0   | 17.6  | 21.0  | 20.8  | 28.4  | 48.4  | 72.9  | 62.1  | 60.1  | 50.0  | 49.0  |
| 90°   | 0.0    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |

LM-79-08: Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Report Prepared for

Cooper Lighting Solutions

MCGRAW, INVUE, LUMARK AND STREETWORKS

DATA VALID FOR LUMINAIRES UTILIZING SA LIGHT ENGINES

Report Number: SP1-2101-121-2

Luminaire Tested: IFLD-S-SA2A-740-U-T3R-HSS

Test Date: 03/05/2021

### Test Information

Test Method: LM-79-08  
 Report Number: SP1-2101-121-2  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1  
 Measurement Geometry:  $4\pi$   
 Issue Date: 03/05/2021  
 Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
 Product Line: STREETWORKS  
 Catalog Number: **IFLD-S-SA2A-740-U-T3R-HSS**  
 Description: STREETWORKS INF FLOOD

SHIELD, DRIVER PROGRAMMED @ 615mA.

### Spectral Parameters

|                           |         |           |      |      |       |
|---------------------------|---------|-----------|------|------|-------|
| CCT (K):                  | 3905    | CRI (Ra): | 71.2 |      |       |
| CIE u':                   | 0.2273  | R1:       | 68.9 | R9:  | -29.7 |
| CIE v':                   | 0.5024  | R2:       | 77.0 | R10: | 46.2  |
| Duv:                      | -0.0008 | R3:       | 84.0 | R11: | 68.8  |
| CIE x:                    | 0.3841  | R4:       | 71.6 | R12: | 45.6  |
| CIE y:                    | 0.3774  | R5:       | 68.9 | R13: | 69.5  |
| CIE z:                    | 0.2385  | R6:       | 68.3 | R14: | 90.7  |
| Peak Wavelength (nm):     | 443     | R7:       | 78.7 |      |       |
| Dominant Wavelength (nm): | 579     | R8:       | 52.2 |      |       |
| Purity:                   | 28.7    |           |      |      |       |
| Rf:                       | 71.7    |           |      |      |       |
| Rg:                       | 96.9    |           |      |      |       |



### Test Conditions

Stabilization Time: 211M  
 Operation Time: 12H  
 Room Temperature (°C) / RH%: 24.8/312%  
 Sphere Temperature (°C): 24.1

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| 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            |

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**CIE 1931 Chromaticity Diagram**



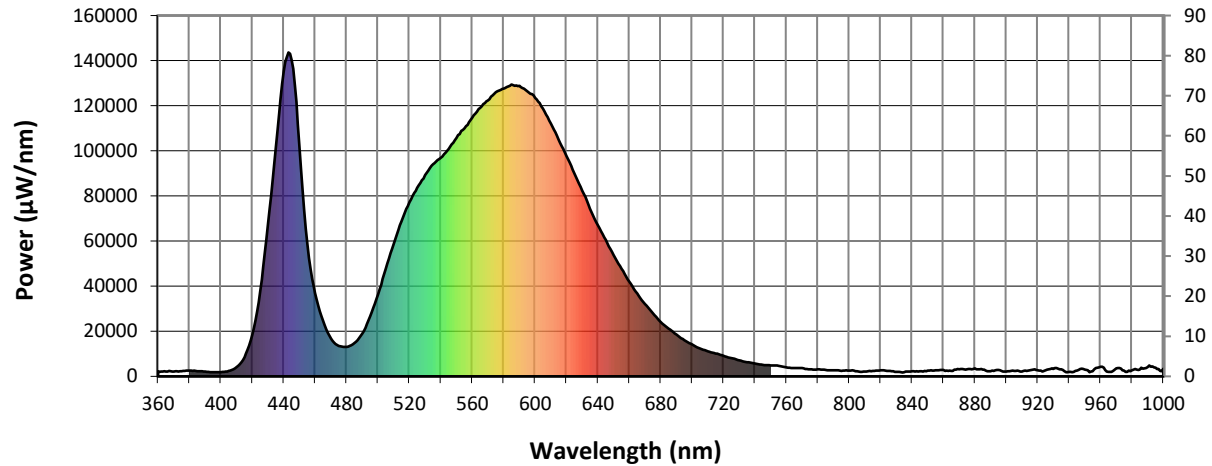
**CIE 1931 Chromaticity Diagram with 2017 ANSI 7-Step and 4-Step Quadrangles**



Point lies inside the ANSI 4000K 4-step quadrangle

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### 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       | 2304             | 0.0              | 490       | 19043            | 2.7              | 620       | 97577            | 25.4             | 750       | 4830             | 0.0              | 880       | 3505             | 0.0              |
| 365       | 2150             | 0.0              | 495       | 26606            | 4.8              | 625       | 90158            | 19.9             | 755       | 4664             | 0.0              | 885       | 2991             | 0.0              |
| 370       | 2146             | 0.0              | 500       | 36376            | 8.0              | 630       | 82240            | 14.9             | 760       | 4006             | 0.0              | 890       | 2327             | 0.0              |
| 375       | 2332             | 0.0              | 505       | 47714            | 13.3             | 635       | 74361            | 11.2             | 765       | 3715             | 0.0              | 895       | 2775             | 0.0              |
| 380       | 2527             | 0.0              | 510       | 58741            | 20.2             | 640       | 66994            | 8.0              | 770       | 3696             | 0.0              | 900       | 2141             | 0.0              |
| 385       | 2304             | 0.0              | 515       | 68716            | 28.5             | 645       | 60405            | 5.8              | 775       | 3117             | 0.0              | 905       | 2421             | 0.0              |
| 390       | 2064             | 0.0              | 520       | 77136            | 37.4             | 650       | 53806            | 3.9              | 780       | 3062             | 0.0              | 910       | 2200             | 0.0              |
| 395       | 1856             | 0.0              | 525       | 83567            | 44.9             | 655       | 47610            | 2.7              | 785       | 2907             | 0.0              | 915       | 2716             | 0.0              |
| 400       | 1856             | 0.0              | 530       | 89283            | 52.6             | 660       | 42018            | 1.8              | 790       | 2655             | 0.0              | 920       | 2656             | 0.0              |
| 405       | 2374             | 0.0              | 535       | 94097            | 58.4             | 665       | 36742            | 1.2              | 795       | 2467             | 0.0              | 925       | 2671             | 0.0              |
| 410       | 4084             | 0.0              | 540       | 96845            | 63.1             | 670       | 32105            | 0.7              | 800       | 2609             | 0.0              | 930       | 3292             | 0.0              |
| 415       | 8543             | 0.0              | 545       | 100829           | 67.1             | 675       | 27946            | 0.5              | 805       | 2293             | 0.0              | 935       | 3188             | 0.0              |
| 420       | 18394            | 0.1              | 550       | 105648           | 71.8             | 680       | 24146            | 0.3              | 810       | 2188             | 0.0              | 940       | 1997             | 0.0              |
| 425       | 37987            | 0.2              | 555       | 110017           | 75.1             | 685       | 21191            | 0.2              | 815       | 2386             | 0.0              | 945       | 2623             | 0.0              |
| 430       | 67605            | 0.5              | 560       | 114586           | 77.9             | 690       | 18544            | 0.1              | 820       | 2712             | 0.0              | 950       | 2969             | 0.0              |
| 435       | 102160           | 1.2              | 565       | 118987           | 79.1             | 695       | 16058            | 0.1              | 825       | 2473             | 0.0              | 955       | 2277             | 0.0              |
| 440       | 135103           | 2.1              | 570       | 122326           | 79.5             | 700       | 14133            | 0.0              | 830       | 1969             | 0.0              | 960       | 4267             | 0.0              |
| 445       | 140126           | 2.9              | 575       | 125968           | 78.4             | 705       | 12309            | 0.0              | 835       | 1917             | 0.0              | 965       | 2034             | 0.0              |
| 450       | 102339           | 2.7              | 580       | 127613           | 75.8             | 710       | 11142            | 0.0              | 840       | 2248             | 0.0              | 970       | 3586             | 0.0              |
| 455       | 58751            | 2.0              | 585       | 129466           | 71.9             | 715       | 10143            | 0.0              | 845       | 2266             | 0.0              | 975       | 2505             | 0.0              |
| 460       | 36892            | 1.5              | 590       | 128813           | 66.6             | 720       | 9072             | 0.0              | 850       | 2558             | 0.0              | 980       | 2666             | 0.0              |
| 465       | 24637            | 1.3              | 595       | 126387           | 59.9             | 725       | 8130             | 0.0              | 855       | 2767             | 0.0              | 985       | 2934             | 0.0              |
| 470       | 16738            | 1.0              | 600       | 123477           | 53.2             | 730       | 7149             | 0.0              | 860       | 2826             | 0.0              | 990       | 4120             | 0.0              |
| 475       | 13456            | 1.1              | 605       | 118718           | 46.0             | 735       | 6311             | 0.0              | 865       | 2385             | 0.0              | 995       | 3858             | 0.0              |
| 480       | 13081            | 1.2              | 610       | 112091           | 38.5             | 740       | 5711             | 0.0              | 870       | 3194             | 0.0              | 1000      | 3405             | 0.0              |
| 485       | 14734            | 1.7              | 615       | 105039           | 31.7             | 745       | 5111             | 0.0              | 875       | 3189             | 0.0              |           |                  |                  |

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### Scotopic Flux vs. Wavelength


**Scotopic Lumens: 10425.8**
**S/P: 1.47**

| $\lambda$<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               | 2304                          | 0.0                            | 490               | 19043                         | 29.3                           | 620               | 97577                         | 1.2                            | 750               | 4830                          | 0.0                            | 880               | 3505                          | 0.0                            |
| 365               | 2150                          | 0.0                            | 495               | 26606                         | 43.0                           | 625               | 90158                         | 0.8                            | 755               | 4664                          | 0.0                            | 885               | 2991                          | 0.0                            |
| 370               | 2146                          | 0.0                            | 500               | 36376                         | 60.8                           | 630               | 82240                         | 0.5                            | 760               | 4006                          | 0.0                            | 890               | 2327                          | 0.0                            |
| 375               | 2332                          | 0.0                            | 505               | 47714                         | 81.1                           | 635               | 74361                         | 0.3                            | 765               | 3715                          | 0.0                            | 895               | 2775                          | 0.0                            |
| 380               | 2527                          | 0.0                            | 510               | 58741                         | 99.6                           | 640               | 66994                         | 0.2                            | 770               | 3696                          | 0.0                            | 900               | 2141                          | 0.0                            |
| 385               | 2304                          | 0.0                            | 515               | 68716                         | 113.9                          | 645               | 60405                         | 0.1                            | 775               | 3117                          | 0.0                            | 905               | 2421                          | 0.0                            |
| 390               | 2064                          | 0.0                            | 520               | 77136                         | 122.6                          | 650               | 53806                         | 0.1                            | 780               | 3062                          | 0.0                            | 910               | 2200                          | 0.0                            |
| 395               | 1856                          | 0.0                            | 525               | 83567                         | 125.0                          | 655               | 47610                         | 0.0                            | 785               | 2907                          | 0.0                            | 915               | 2716                          | 0.0                            |
| 400               | 1856                          | 0.0                            | 530               | 89283                         | 123.1                          | 660               | 42018                         | 0.0                            | 790               | 2655                          | 0.0                            | 920               | 2656                          | 0.0                            |
| 405               | 2374                          | 0.1                            | 535               | 94097                         | 117.3                          | 665               | 36742                         | 0.0                            | 795               | 2467                          | 0.0                            | 925               | 2671                          | 0.0                            |
| 410               | 4084                          | 0.2                            | 540               | 96845                         | 107.0                          | 670               | 32105                         | 0.0                            | 800               | 2609                          | 0.0                            | 930               | 3292                          | 0.0                            |
| 415               | 8543                          | 0.9                            | 545               | 100829                        | 96.7                           | 675               | 27946                         | 0.0                            | 805               | 2293                          | 0.0                            | 935               | 3188                          | 0.0                            |
| 420               | 18394                         | 3.0                            | 550               | 105648                        | 86.4                           | 680               | 24146                         | 0.0                            | 810               | 2188                          | 0.0                            | 940               | 1997                          | 0.0                            |
| 425               | 37987                         | 9.3                            | 555               | 110017                        | 75.2                           | 685               | 21191                         | 0.0                            | 815               | 2386                          | 0.0                            | 945               | 2623                          | 0.0                            |
| 430               | 67605                         | 23.0                           | 560               | 114586                        | 64.0                           | 690               | 18544                         | 0.0                            | 820               | 2712                          | 0.0                            | 950               | 2969                          | 0.0                            |
| 435               | 102160                        | 45.7                           | 565               | 118987                        | 53.4                           | 695               | 16058                         | 0.0                            | 825               | 2473                          | 0.0                            | 955               | 2277                          | 0.0                            |
| 440               | 135103                        | 75.5                           | 570               | 122326                        | 43.2                           | 700               | 14133                         | 0.0                            | 830               | 1969                          | 0.0                            | 960               | 4267                          | 0.0                            |
| 445               | 140126                        | 93.8                           | 575               | 125968                        | 34.3                           | 705               | 12309                         | 0.0                            | 835               | 1917                          | 0.0                            | 965               | 2034                          | 0.0                            |
| 450               | 102339                        | 79.3                           | 580               | 127613                        | 26.3                           | 710               | 11142                         | 0.0                            | 840               | 2248                          | 0.0                            | 970               | 3586                          | 0.0                            |
| 455               | 58751                         | 51.3                           | 585               | 129466                        | 19.8                           | 715               | 10143                         | 0.0                            | 845               | 2266                          | 0.0                            | 975               | 2505                          | 0.0                            |
| 460               | 36892                         | 35.6                           | 590               | 128813                        | 14.3                           | 720               | 9072                          | 0.0                            | 850               | 2558                          | 0.0                            | 980               | 2666                          | 0.0                            |
| 465               | 24637                         | 26.0                           | 595               | 126387                        | 10.1                           | 725               | 8130                          | 0.0                            | 855               | 2767                          | 0.0                            | 985               | 2934                          | 0.0                            |
| 470               | 16738                         | 19.3                           | 600               | 123477                        | 7.0                            | 730               | 7149                          | 0.0                            | 860               | 2826                          | 0.0                            | 990               | 4120                          | 0.0                            |
| 475               | 13456                         | 16.8                           | 605               | 118718                        | 4.7                            | 735               | 6311                          | 0.0                            | 865               | 2385                          | 0.0                            | 995               | 3858                          | 0.0                            |
| 480               | 13081                         | 17.7                           | 610               | 112091                        | 3.0                            | 740               | 5711                          | 0.0                            | 870               | 3194                          | 0.0                            | 1000              | 3405                          | 0.0                            |
| 485               | 14734                         | 21.4                           | 615               | 105039                        | 1.9                            | 745               | 5111                          | 0.0                            | 875               | 3189                          | 0.0                            |                   |                               |                                |

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### Melanopic Flux vs. Wavelength



**Melanopic Lumens: 3927.2**

**M/P: 0.55**

| 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       | 2304             | 0.0              | 490       | 19043            | 15.8             | 620       | 97577            | 0.1              | 750       | 4830             | 0.0              | 880       | 3505             | 0.0              |
| 365       | 2150             | 0.0              | 495       | 26606            | 22.0             | 625       | 90158            | 0.0              | 755       | 4664             | 0.0              | 885       | 2991             | 0.0              |
| 370       | 2146             | 0.0              | 500       | 36376            | 29.2             | 630       | 82240            | 0.0              | 760       | 4006             | 0.0              | 890       | 2327             | 0.0              |
| 375       | 2332             | 0.0              | 505       | 47714            | 36.6             | 635       | 74361            | 0.0              | 765       | 3715             | 0.0              | 895       | 2775             | 0.0              |
| 380       | 2527             | 0.0              | 510       | 58741            | 42.2             | 640       | 66994            | 0.0              | 770       | 3696             | 0.0              | 900       | 2141             | 0.0              |
| 385       | 2304             | 0.0              | 515       | 68716            | 44.9             | 645       | 60405            | 0.0              | 775       | 3117             | 0.0              | 905       | 2421             | 0.0              |
| 390       | 2064             | 0.0              | 520       | 77136            | 44.9             | 650       | 53806            | 0.0              | 780       | 3062             | 0.0              | 910       | 2200             | 0.0              |
| 395       | 1856             | 0.0              | 525       | 83567            | 42.4             | 655       | 47610            | 0.0              | 785       | 2907             | 0.0              | 915       | 2716             | 0.0              |
| 400       | 1856             | 0.0              | 530       | 89283            | 38.6             | 660       | 42018            | 0.0              | 790       | 2655             | 0.0              | 920       | 2656             | 0.0              |
| 405       | 2374             | 0.0              | 535       | 94097            | 33.9             | 665       | 36742            | 0.0              | 795       | 2467             | 0.0              | 925       | 2671             | 0.0              |
| 410       | 4084             | 0.2              | 540       | 96845            | 28.3             | 670       | 32105            | 0.0              | 800       | 2609             | 0.0              | 930       | 3292             | 0.0              |
| 415       | 8543             | 0.6              | 545       | 100829           | 23.4             | 675       | 27946            | 0.0              | 805       | 2293             | 0.0              | 935       | 3188             | 0.0              |
| 420       | 18394            | 2.1              | 550       | 105648           | 19.0             | 680       | 24146            | 0.0              | 810       | 2188             | 0.0              | 940       | 1997             | 0.0              |
| 425       | 37987            | 5.9              | 555       | 110017           | 14.8             | 685       | 21191            | 0.0              | 815       | 2386             | 0.0              | 945       | 2623             | 0.0              |
| 430       | 67605            | 14.3             | 560       | 114586           | 11.3             | 690       | 18544            | 0.0              | 820       | 2712             | 0.0              | 950       | 2969             | 0.0              |
| 435       | 102160           | 27.3             | 565       | 118987           | 8.4              | 695       | 16058            | 0.0              | 825       | 2473             | 0.0              | 955       | 2277             | 0.0              |
| 440       | 135103           | 45.1             | 570       | 122326           | 6.0              | 700       | 14133            | 0.0              | 830       | 1969             | 0.0              | 960       | 4267             | 0.0              |
| 445       | 140126           | 55.3             | 575       | 125968           | 4.2              | 705       | 12309            | 0.0              | 835       | 1917             | 0.0              | 965       | 2034             | 0.0              |
| 450       | 102339           | 47.2             | 580       | 127613           | 2.9              | 710       | 11142            | 0.0              | 840       | 2248             | 0.0              | 970       | 3586             | 0.0              |
| 455       | 58751            | 30.8             | 585       | 129466           | 1.9              | 715       | 10143            | 0.0              | 845       | 2266             | 0.0              | 975       | 2505             | 0.0              |
| 460       | 36892            | 21.7             | 590       | 128813           | 1.3              | 720       | 9072             | 0.0              | 850       | 2558             | 0.0              | 980       | 2666             | 0.0              |
| 465       | 24637            | 16.1             | 595       | 126387           | 0.8              | 725       | 8130             | 0.0              | 855       | 2767             | 0.0              | 985       | 2934             | 0.0              |
| 470       | 16738            | 12.0             | 600       | 123477           | 0.5              | 730       | 7149             | 0.0              | 860       | 2826             | 0.0              | 990       | 4120             | 0.0              |
| 475       | 13456            | 10.3             | 605       | 118718           | 0.3              | 735       | 6311             | 0.0              | 865       | 2385             | 0.0              | 995       | 3858             | 0.0              |
| 480       | 13081            | 10.5             | 610       | 112091           | 0.2              | 740       | 5711             | 0.0              | 870       | 3194             | 0.0              | 1000      | 3405             | 0.0              |
| 485       | 14734            | 12.1             | 615       | 105039           | 0.1              | 745       | 5111             | 0.0              | 875       | 3189             | 0.0              |           |                  |                  |

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TM-30-18

### Summary

$R_f = 71.7$   
 $R_g = 96.9$   
 CIE  $R_a = 71.2$   
 $R_g = -29.7$



### Color Vector Graphics



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

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 85 | CES26 = 55 | CES51 = 86 | CES76 = 45 |
| CES02 = 61 | CES27 = 80 | CES52 = 87 | CES77 = 68 |
| CES03 = 30 | CES28 = 79 | CES53 = 74 | CES78 = 49 |
| CES04 = 70 | CES29 = 51 | CES54 = 81 | CES79 = 77 |
| CES05 = 47 | CES30 = 60 | CES55 = 80 | CES80 = 75 |
| CES06 = 50 | CES31 = 56 | CES56 = 69 | CES81 = 75 |
| CES07 = 40 | CES32 = 52 | CES57 = 67 | CES82 = 90 |
| CES08 = 39 | CES33 = 62 | CES58 = 69 | CES83 = 85 |
| CES09 = 29 | CES34 = 65 | CES59 = 86 | CES84 = 87 |
| CES10 = 74 | CES35 = 81 | CES60 = 91 | CES85 = 83 |
| CES11 = 57 | CES36 = 92 | CES61 = 85 | CES86 = 72 |
| CES12 = 63 | CES37 = 74 | CES62 = 81 | CES87 = 77 |
| CES13 = 42 | CES38 = 69 | CES63 = 72 | CES88 = 77 |
| CES14 = 74 | CES39 = 92 | CES64 = 69 | CES89 = 72 |
| CES15 = 71 | CES40 = 86 | CES65 = 64 | CES90 = 75 |
| CES16 = 46 | CES41 = 84 | CES66 = 63 | CES91 = 91 |
| CES17 = 49 | CES42 = 75 | CES67 = 60 | CES92 = 66 |
| CES18 = 56 | CES43 = 70 | CES68 = 67 | CES93 = 80 |
| CES19 = 72 | CES44 = 98 | CES69 = 77 | CES94 = 56 |
| CES20 = 65 | CES45 = 80 | CES70 = 57 | CES95 = 72 |
| CES21 = 86 | CES46 = 77 | CES71 = 53 | CES96 = 78 |
| CES22 = 78 | CES47 = 74 | CES72 = 84 | CES97 = 83 |
| CES23 = 92 | CES48 = 66 | CES73 = 47 | CES98 = 73 |
| CES24 = 91 | CES49 = 76 | CES74 = 96 | CES99 = 63 |
| CES25 = 72 | CES50 = 85 | CES75 = 52 |            |



Color Rendition by Hue-Angle Bin



**Measure Comparisons**



(END OF REPORT)