

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



Scaled data based on original data using  
LM-79-08 Approved Method: Electrical and Photometric Measurements of Solid-  
State Lighting Products

Test Report Prepared for  
Cooper Lighting Solutions  
(formerly Eaton)

Brand: McGRAW-EDISON

Report Number: P322549

Luminaire Tested: **GLEON-SA5A-740-U-T4FT-HSS**

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-08  
Report Number: P322549  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-17)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: McGRAW-EDISON  
Catalog Number: GLEON-SA5A-740-U-T4FT-HSS  
Description: GALLEON AREA AND ROADWAY LUMINAIRE  
(5) 70 CRI, 4000K, 615mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE IV  
FORWARD THROW OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 16540 lumens  
Efficiency: N/A  
Efficacy: 102.1 lumens/watt  
Luminous Opening: Rectangular (W 1.5' x L: 1' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B2 - U0 - G4

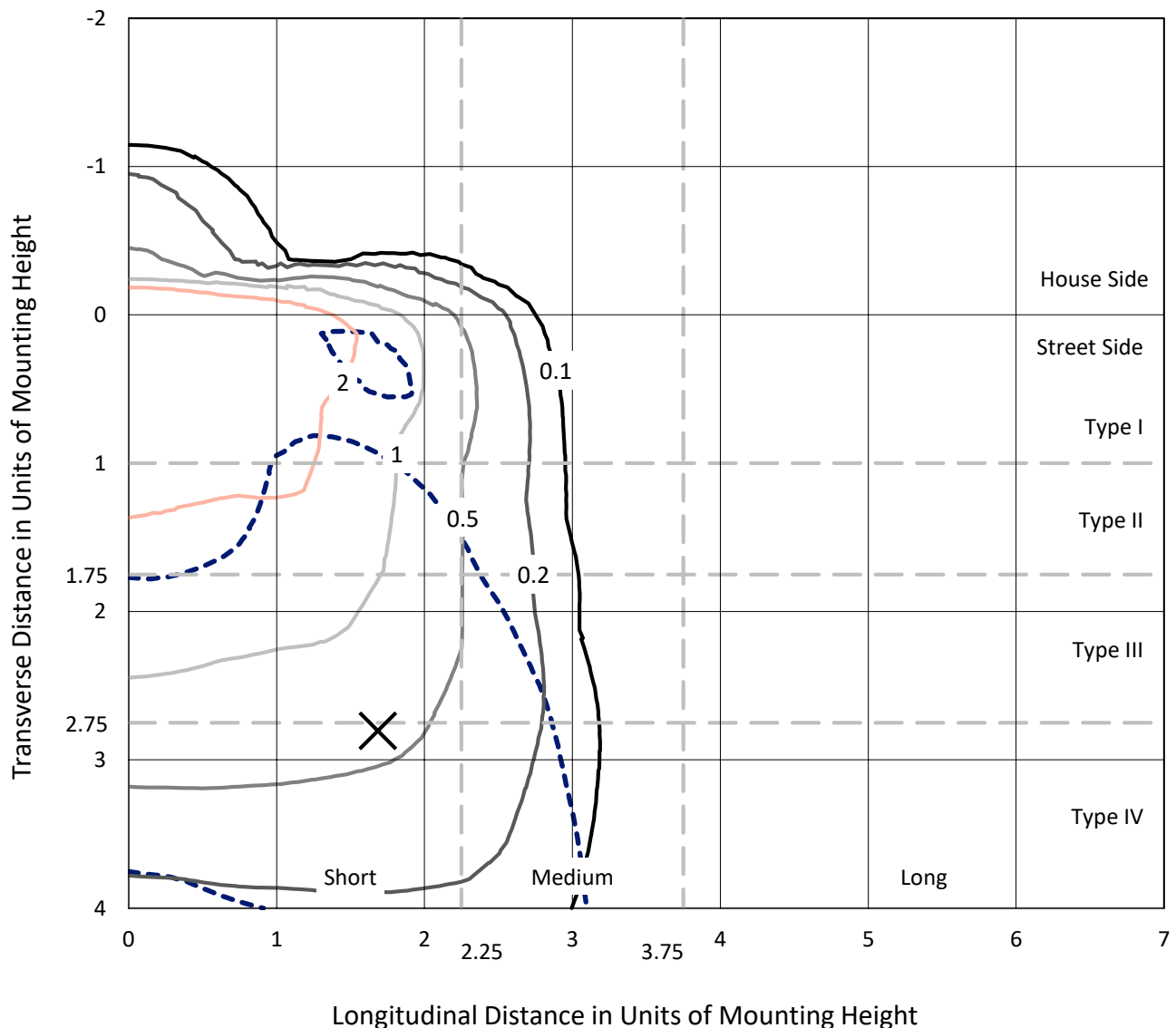
Input Watts (W): 162  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 24 FT



REPORT NUMBER: P322549  
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## Iso-Footcandle Lines of Horizontal Illumination

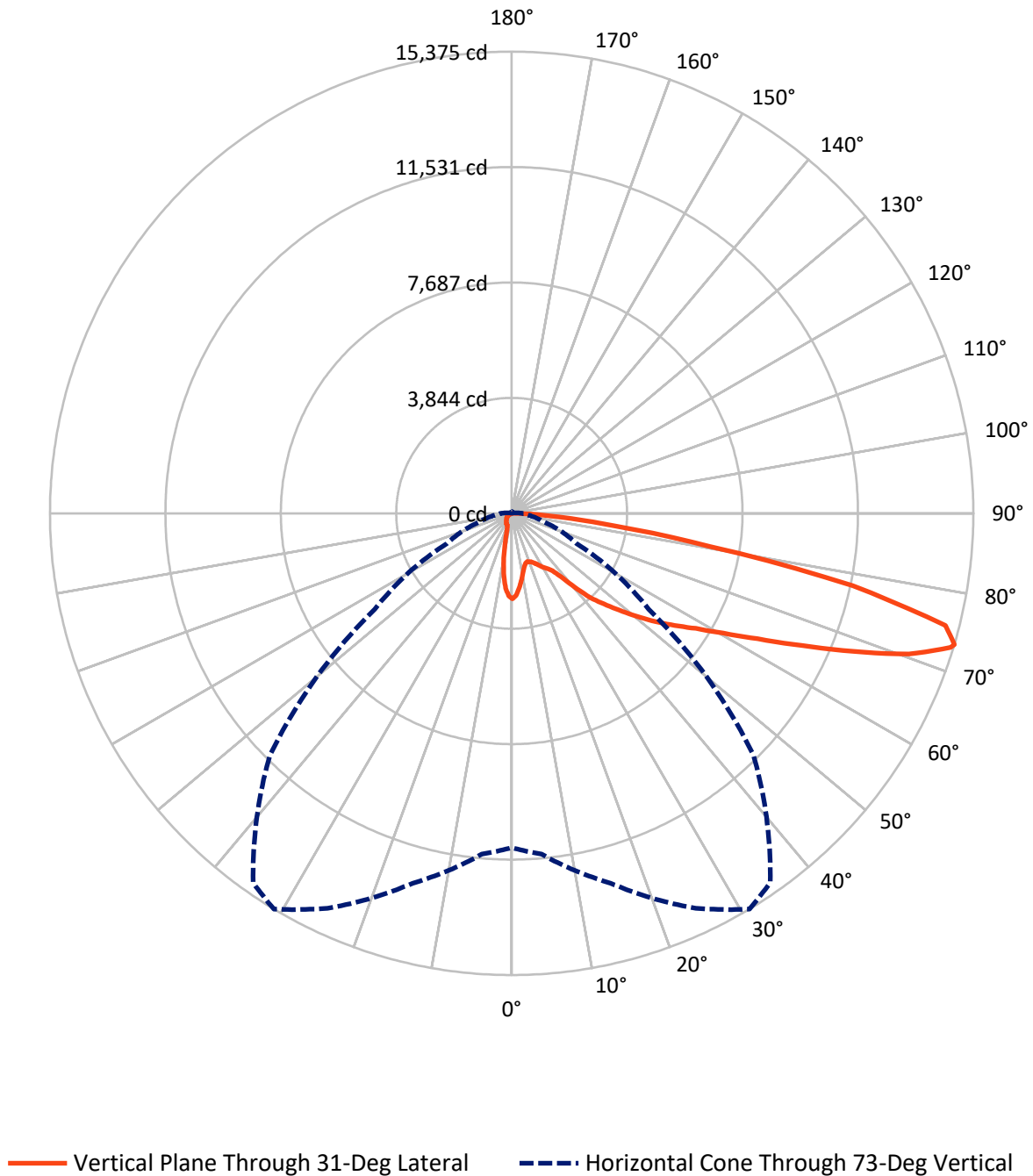
× Max cd  
 - - - 1/2 Max cd



Based on 25 foot mounting height. Maximum calculated value = 4.6 fc  
 Type IV - Short - N/A

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## Luminous Intensity Polar Plot



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**FLUX DISTRIBUTION:**

|                    |           | Downward | Upward | Total   |
|--------------------|-----------|----------|--------|---------|
| <b>House Side</b>  | Lumens    | 1507.7   | 0.0    | 1507.7  |
|                    | % Fixture | 9.1      | 0.0    | 9.1     |
| <b>Street Side</b> | Lumens    | 15032.3  | 0.0    | 15032.3 |
|                    | % Fixture | 90.9     | 0.0    | 90.9    |
| <b>Total</b>       | Lumens    | 16540.0  | 0.0    | 16540.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 236.0   | 1.4       |
| 10°-20°   | 512.3   | 3.1       |
| 20°-30°   | 767.6   | 4.6       |
| 30°-40°   | 1221.3  | 7.4       |
| 40°-50°   | 2180.8  | 13.2      |
| 50°-60°   | 3384.0  | 20.5      |
| 60°-70°   | 4498.6  | 27.2      |
| 70°-80°   | 3383.9  | 20.5      |
| 80°-90°   | 355.6   | 2.1       |
| 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°-90°    | 16540.0 | 100.0     |
| 0°-180°   | 16540.0 | 100.0     |

**Coefficient of Utilization**



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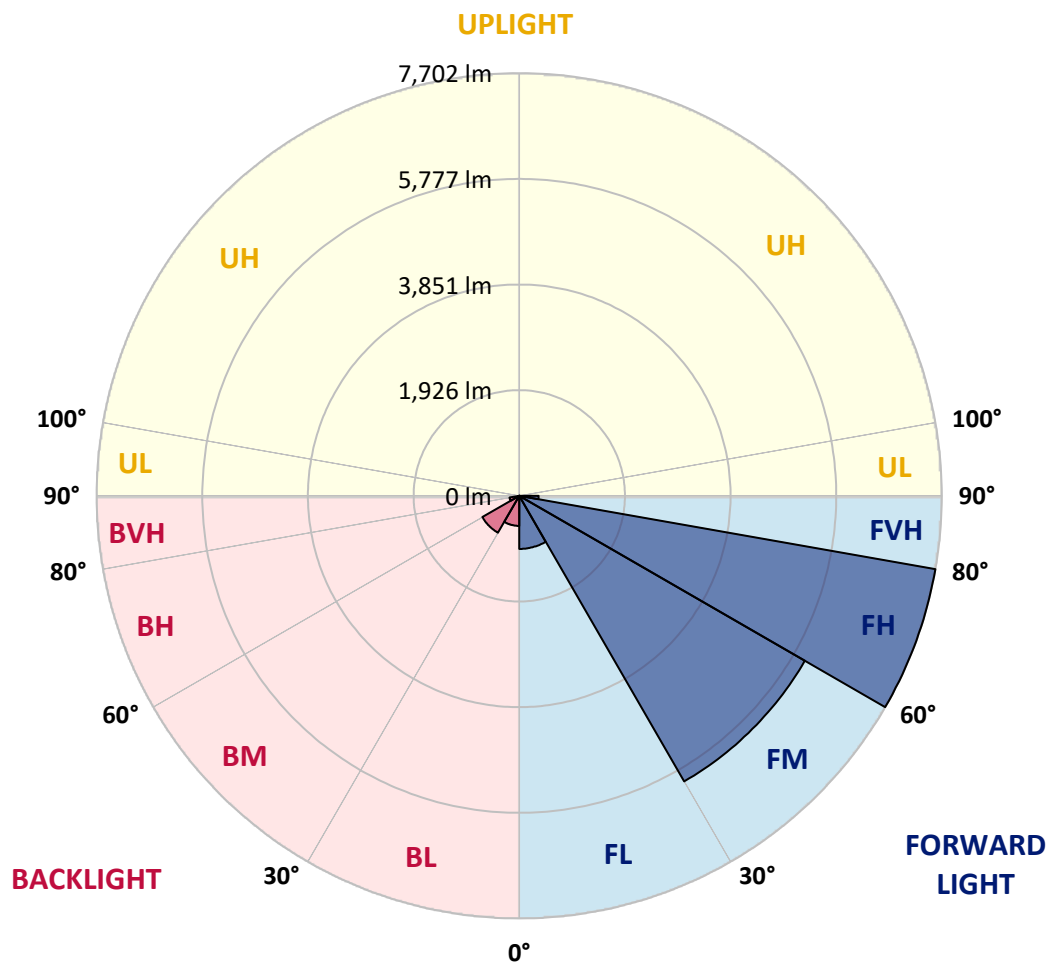
CATALOG NUMBER: GLEON-SA5A-740-U-T4FT-HSS

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |          |
|------|-------------|--------|-----------|-------------------------|------|----------|
|      |             |        |           | B                       | U    | G        |
| FL   | (0°-30°)    | 967.6  | 5.9       |                         |      |          |
| FM   | (30°-60°)   | 6010.1 | 36.3      |                         |      |          |
| FH   | (60°-80°)   | 7702.1 | 46.6      |                         |      | G4/12000 |
| FVH  | (80°-90°)   | 352.6  | 2.1       |                         |      | G3/500   |
| BL   | (0°-30°)    | 548.3  | 3.3       | B2/1000                 |      |          |
| BM   | (30°-60°)   | 776.0  | 4.7       | B1/1000                 |      |          |
| BH   | (60°-80°)   | 180.4  | 1.1       | B1/500                  |      | G1/500   |
| BVH  | (80°-90°)   | 3.0    | 0.0       |                         |      | G0/10    |
| UL   | (90°-100°)  | 0.0    | 0.0       |                         | U0/0 |          |
| UH   | (100°-180°) | 0.0    | 0.0       |                         | U0/0 |          |

**BUG Rating: B2-U0-G4**

Type IV Short





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CATALOG NUMBER: GLEON-SA5A-740-U-T4FT-HSS

**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 31°     | 35°     | 45°     | 55°    | 65°    | 75°    | 85°    |
|-------|---------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|
| 0°    | 2845.7  | 2845.7  | 2845.7  | 2845.7  | 2845.7  | 2845.7  | 2845.7  | 2845.7 | 2845.7 | 2845.7 | 2845.7 |
| 2.5°  | 2696.8  | 2708.1  | 2720.3  | 2722.7  | 2743.0  | 2743.8  | 2772.9  | 2794.8 | 2816.6 | 2837.6 | 2844.9 |
| 5°    | 2420.0  | 2438.6  | 2460.5  | 2482.3  | 2525.2  | 2542.2  | 2613.5  | 2686.3 | 2755.9 | 2822.3 | 2854.6 |
| 7.5°  | 2124.6  | 2145.6  | 2176.4  | 2230.6  | 2278.4  | 2311.6  | 2424.1  | 2553.6 | 2683.1 | 2805.3 | 2875.7 |
| 10°   | 1855.1  | 1874.5  | 1906.9  | 1964.3  | 2038.0  | 2083.3  | 2234.7  | 2414.3 | 2604.5 | 2789.9 | 2907.3 |
| 12.5° | 1683.5  | 1694.0  | 1711.8  | 1773.3  | 1839.7  | 1890.7  | 2068.7  | 2291.3 | 2539.8 | 2789.1 | 2958.2 |
| 15°   | 1651.9  | 1655.2  | 1640.6  | 1668.1  | 1719.9  | 1769.3  | 1949.8  | 2191.8 | 2490.4 | 2802.0 | 3024.6 |
| 17.5° | 1702.1  | 1700.5  | 1651.9  | 1648.7  | 1690.0  | 1730.4  | 1891.5  | 2123.0 | 2455.6 | 2832.0 | 3110.4 |
| 20°   | 1778.2  | 1772.5  | 1688.3  | 1673.0  | 1716.7  | 1754.7  | 1887.4  | 2097.1 | 2442.7 | 2882.2 | 3214.8 |
| 22.5° | 1879.4  | 1869.6  | 1737.7  | 1721.5  | 1768.5  | 1808.1  | 1937.6  | 2122.2 | 2454.0 | 2949.3 | 3336.2 |
| 25°   | 2004.8  | 1990.2  | 1822.7  | 1804.9  | 1852.6  | 1892.3  | 2027.5  | 2194.2 | 2488.0 | 3031.1 | 3490.0 |
| 27.5° | 2146.4  | 2125.4  | 1958.7  | 1912.5  | 1966.8  | 2008.0  | 2147.3  | 2304.3 | 2541.4 | 3117.7 | 3678.6 |
| 30°   | 2280.0  | 2252.5  | 2101.9  | 2025.9  | 2092.2  | 2138.4  | 2276.8  | 2435.4 | 2627.2 | 3251.2 | 3936.8 |
| 32.5° | 2414.3  | 2383.6  | 2229.8  | 2139.2  | 2199.1  | 2249.2  | 2410.3  | 2615.9 | 2788.3 | 3455.2 | 4279.9 |
| 35°   | 2723.5  | 2691.2  | 2502.6  | 2352.8  | 2352.0  | 2380.4  | 2597.3  | 2862.7 | 3001.1 | 3739.3 | 4689.5 |
| 37.5° | 3244.0  | 3225.3  | 3045.7  | 2761.6  | 2685.5  | 2653.9  | 2852.2  | 3157.3 | 3307.1 | 4130.2 | 5151.6 |
| 40°   | 3813.7  | 3797.6  | 3596.0  | 3338.6  | 3222.9  | 3145.2  | 3218.1  | 3567.7 | 3739.3 | 4607.7 | 5623.5 |
| 42.5° | 4457.2  | 4380.3  | 4020.9  | 3944.1  | 3840.5  | 3781.4  | 3715.8  | 4073.6 | 4270.2 | 5127.4 | 6091.3 |
| 45°   | 5041.6  | 4912.1  | 4445.9  | 4329.3  | 4305.8  | 4320.4  | 4356.8  | 4753.4 | 4867.5 | 5744.9 | 6557.5 |
| 47.5° | 5389.6  | 5287.6  | 4929.9  | 4818.2  | 4811.7  | 4908.0  | 5183.2  | 5521.5 | 5462.4 | 6283.1 | 6967.9 |
| 50°   | 5720.6  | 5628.4  | 5331.3  | 5358.8  | 5388.8  | 5519.9  | 6121.3  | 6311.5 | 6005.5 | 6771.2 | 7344.2 |
| 52.5° | 5988.5  | 5847.7  | 5692.3  | 5846.9  | 5994.2  | 6205.4  | 7089.3  | 7020.5 | 6390.8 | 7159.7 | 7666.3 |
| 55°   | 6143.1  | 6079.2  | 6154.4  | 6309.8  | 6586.6  | 6929.8  | 8003.0  | 7610.5 | 6672.4 | 7514.2 | 7880.8 |
| 57.5° | 6709.7  | 6584.2  | 6733.9  | 6868.3  | 7229.3  | 7709.2  | 8785.7  | 8050.0 | 6875.6 | 7733.5 | 7930.2 |
| 60°   | 7395.2  | 7294.0  | 7382.3  | 7605.6  | 8092.9  | 8657.0  | 9517.4  | 8408.5 | 6981.6 | 7874.3 | 7802.3 |
| 62.5° | 8486.2  | 8352.7  | 8297.6  | 8547.7  | 9193.6  | 9809.6  | 10072.6 | 8657.0 | 6958.1 | 7812.0 | 7363.6 |
| 65°   | 9948.0  | 9809.6  | 9563.5  | 9790.1  | 10611.6 | 11046.3 | 10693.4 | 8709.6 | 6796.3 | 7307.8 | 6254.8 |
| 67.5° | 11445.3 | 11344.9 | 11134.5 | 11516.5 | 12257.9 | 12397.9 | 11349.8 | 8581.7 | 6275.0 | 5925.4 | 4419.2 |
| 70°   | 12434.3 | 12391.4 | 12528.2 | 13373.2 | 14034.5 | 13994.0 | 11951.9 | 7894.6 | 4891.0 | 3643.8 | 2186.1 |
| 72.5° | 11721.3 | 11926.9 | 12937.0 | 14469.1 | 15276.8 | 14946.6 | 11642.8 | 6062.2 | 2795.6 | 1401.8 | 632.1  |
| 73°   | 11130.4 | 11393.5 | 12753.2 | 14510.4 | 15374.8 | 15013.0 | 11383.0 | 5564.4 | 2382.8 | 1106.4 | 479.1  |
| 75°   | 7743.2  | 8066.2  | 10558.2 | 13514.0 | 14916.7 | 14304.0 | 9488.2  | 3405.8 | 1104.0 | 490.5  | 193.4  |
| 77.5° | 3759.5  | 3998.3  | 5813.7  | 9764.2  | 11600.7 | 11175.8 | 5906.8  | 1269.1 | 498.6  | 306.8  | 89.0   |
| 80°   | 1403.4  | 1560.5  | 2523.6  | 4969.5  | 6704.0  | 6879.6  | 2598.1  | 480.0  | 331.8  | 246.9  | 45.3   |
| 82.5° | 367.5   | 409.5   | 930.8   | 2216.1  | 3435.8  | 3596.0  | 819.1   | 242.0  | 242.8  | 203.2  | 27.5   |
| 85°   | 117.4   | 134.4   | 290.6   | 994.7   | 1618.7  | 1421.3  | 213.7   | 117.4  | 176.4  | 151.4  | 15.4   |
| 87.5° | 14.6    | 18.6    | 92.3    | 233.9   | 356.9   | 198.3   | 33.2    | 34.8   | 75.3   | 84.2   | 8.9    |
| 90°   | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0     | 0.0    | 0.0    | 0.0    | 0.0    |



REPORT NUMBER: P322549

CATALOG NUMBER: GLEON-SA5A-740-U-T4FT-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°    | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 2845.7 | 2845.7 | 2845.7 | 2845.7 | 2845.7 | 2845.7 | 2845.7 | 2845.7 | 2845.7 | 2845.7 | 2845.7 |
| 2.5°  | 2852.2 | 2848.2 | 2849.0 | 2827.9 | 2814.2 | 2786.7 | 2758.3 | 2745.4 | 2731.6 | 2726.0 | 2731.6 |
| 5°    | 2866.8 | 2859.5 | 2838.5 | 2773.7 | 2704.9 | 2615.9 | 2532.5 | 2469.4 | 2390.1 | 2368.2 | 2390.9 |
| 7.5°  | 2889.4 | 2874.9 | 2813.4 | 2681.4 | 2528.5 | 2358.5 | 2167.5 | 2028.3 | 1914.2 | 1840.5 | 1867.2 |
| 10°   | 2922.6 | 2895.1 | 2771.3 | 2547.1 | 2273.5 | 1972.4 | 1701.3 | 1490.0 | 1340.3 | 1278.8 | 1276.4 |
| 12.5° | 2978.5 | 2926.7 | 2719.5 | 2372.3 | 1961.9 | 1560.5 | 1205.2 | 976.1  | 854.7  | 776.2  | 774.6  |
| 15°   | 3040.0 | 2963.9 | 2653.9 | 2162.6 | 1599.3 | 1117.7 | 776.2  | 602.2  | 523.7  | 498.6  | 495.3  |
| 17.5° | 3115.3 | 3006.8 | 2568.9 | 1904.4 | 1219.7 | 740.6  | 506.7  | 456.5  | 453.2  | 450.8  | 450.8  |
| 20°   | 3210.0 | 3057.8 | 2459.7 | 1609.0 | 865.2  | 494.5  | 430.6  | 433.8  | 435.4  | 432.2  | 433.0  |
| 22.5° | 3320.0 | 3109.6 | 2329.4 | 1291.8 | 585.2  | 413.6  | 412.0  | 416.0  | 417.6  | 416.0  | 416.8  |
| 25°   | 3447.9 | 3169.5 | 2170.7 | 959.1  | 422.5  | 392.5  | 396.6  | 402.3  | 406.3  | 406.3  | 406.3  |
| 27.5° | 3606.5 | 3242.3 | 1979.7 | 669.3  | 365.0  | 370.7  | 382.0  | 392.5  | 398.2  | 399.8  | 399.8  |
| 30°   | 3812.9 | 3333.0 | 1750.7 | 458.9  | 331.8  | 341.6  | 362.6  | 382.8  | 393.4  | 395.0  | 395.8  |
| 32.5° | 4073.6 | 3435.0 | 1485.2 | 339.1  | 303.5  | 310.8  | 333.5  | 367.5  | 387.7  | 390.9  | 390.9  |
| 35°   | 4372.2 | 3553.1 | 1199.5 | 295.4  | 283.3  | 285.7  | 303.5  | 342.4  | 378.0  | 386.9  | 387.7  |
| 37.5° | 4699.2 | 3669.7 | 912.2  | 276.0  | 266.3  | 266.3  | 279.2  | 312.4  | 354.5  | 382.0  | 385.3  |
| 40°   | 5004.3 | 3740.1 | 639.4  | 260.6  | 250.9  | 250.9  | 262.2  | 286.5  | 326.2  | 367.5  | 376.4  |
| 42.5° | 5286.0 | 3764.4 | 445.2  | 246.0  | 236.3  | 238.8  | 248.5  | 267.9  | 297.8  | 339.1  | 347.2  |
| 45°   | 5575.7 | 3760.3 | 324.6  | 229.1  | 221.8  | 229.1  | 236.3  | 250.9  | 272.8  | 296.2  | 297.8  |
| 47.5° | 5794.3 | 3726.3 | 257.4  | 212.9  | 208.0  | 217.7  | 224.2  | 233.9  | 246.0  | 244.4  | 244.4  |
| 50°   | 5999.0 | 3643.8 | 207.2  | 191.0  | 194.2  | 205.6  | 208.8  | 212.1  | 212.9  | 197.5  | 195.9  |
| 52.5° | 6154.4 | 3515.1 | 165.9  | 167.5  | 180.5  | 191.8  | 188.6  | 183.7  | 175.6  | 157.0  | 153.8  |
| 55°   | 6206.2 | 3267.4 | 130.3  | 138.4  | 160.3  | 174.8  | 162.7  | 152.2  | 136.8  | 121.4  | 118.2  |
| 57.5° | 6112.4 | 2947.7 | 106.0  | 107.6  | 135.2  | 147.3  | 133.5  | 121.4  | 104.4  | 91.5   | 89.0   |
| 60°   | 5913.2 | 2592.4 | 87.4   | 80.9   | 104.4  | 114.9  | 106.0  | 93.9   | 78.5   | 68.8   | 68.0   |
| 62.5° | 5518.3 | 2213.6 | 72.0   | 63.1   | 79.3   | 88.2   | 82.6   | 73.7   | 60.7   | 54.2   | 53.4   |
| 65°   | 4687.9 | 1770.9 | 58.3   | 51.0   | 61.5   | 68.8   | 63.9   | 57.5   | 47.8   | 42.9   | 42.1   |
| 67.5° | 3272.3 | 1197.1 | 47.8   | 42.1   | 48.6   | 54.2   | 50.2   | 46.9   | 38.0   | 37.2   | 38.0   |
| 70°   | 1578.3 | 577.1  | 39.7   | 34.0   | 38.0   | 42.1   | 40.5   | 38.0   | 36.4   | 42.1   | 48.6   |
| 72.5° | 452.4  | 193.4  | 31.6   | 28.3   | 30.8   | 33.2   | 34.8   | 34.0   | 39.7   | 51.0   | 59.1   |
| 73°   | 348.0  | 156.2  | 29.9   | 26.7   | 29.1   | 32.4   | 34.0   | 33.2   | 40.5   | 51.8   | 59.1   |
| 75°   | 148.9  | 75.3   | 22.7   | 21.9   | 24.3   | 28.3   | 29.9   | 29.9   | 40.5   | 52.6   | 56.7   |
| 77.5° | 67.2   | 40.5   | 14.6   | 17.0   | 21.0   | 22.7   | 25.1   | 25.1   | 32.4   | 40.5   | 40.5   |
| 80°   | 38.0   | 21.9   | 11.3   | 12.9   | 15.4   | 15.4   | 15.4   | 13.8   | 14.6   | 16.2   | 17.8   |
| 82.5° | 24.3   | 14.6   | 8.9    | 10.5   | 9.7    | 8.1    | 6.5    | 6.5    | 5.7    | 6.5    | 8.1    |
| 85°   | 13.8   | 8.1    | 8.1    | 6.5    | 4.0    | 3.2    | 4.0    | 3.2    | 0.8    | 0.0    | 0.8    |
| 87.5° | 8.1    | 4.9    | 2.4    | 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    |

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

REPORT NUMBER: SP1-2101-121-2

| 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)