

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: P323019

Luminaire Tested: **GLEON-SA5D-827-U-T4W-HSS**

Issue Date: 3/3/2020

**Test Information**

Test Method: LM-79-08  
Report Number: P323019  
TEST IS SCALED FROM IESNA LM-79-08 TEST DATA (G2-1903-205-19)  
Test Lab: INNOVATION CENTER  
Issue Date: 3/3/2020  
Manufacturer: COOPER LIGHTING SOLUTIONS (FORMERLY EATON)  
Product Line: McGRAW-EDISON  
Catalog Number: GLEON-SA5D-827-U-T4W-HSS  
Description: GALLEON AREA AND ROADWAY LUMINAIRE  
(5) 80 CRI, 2700K, 1200mA LIGHTSQUARES WITH 16 LEDS EACH AND TYPE IV WIDE OPTICS WITH HOUSE SIDE SHIELD  
Light Source: -  
Ballast/Driver: ELECTRONIC DRIVER

**Summary**

Lumens per Lamp: N/A  
Luminaire Lumens: 20663 lumens  
Efficiency: N/A  
Efficacy: 64.6 lumens/watt  
Luminous Opening: Rectangular (W 1.5' x L: 1' x H: 0')  
IES Classification: Type IV - Short  
BUG Rating: B2 - U0 - G4

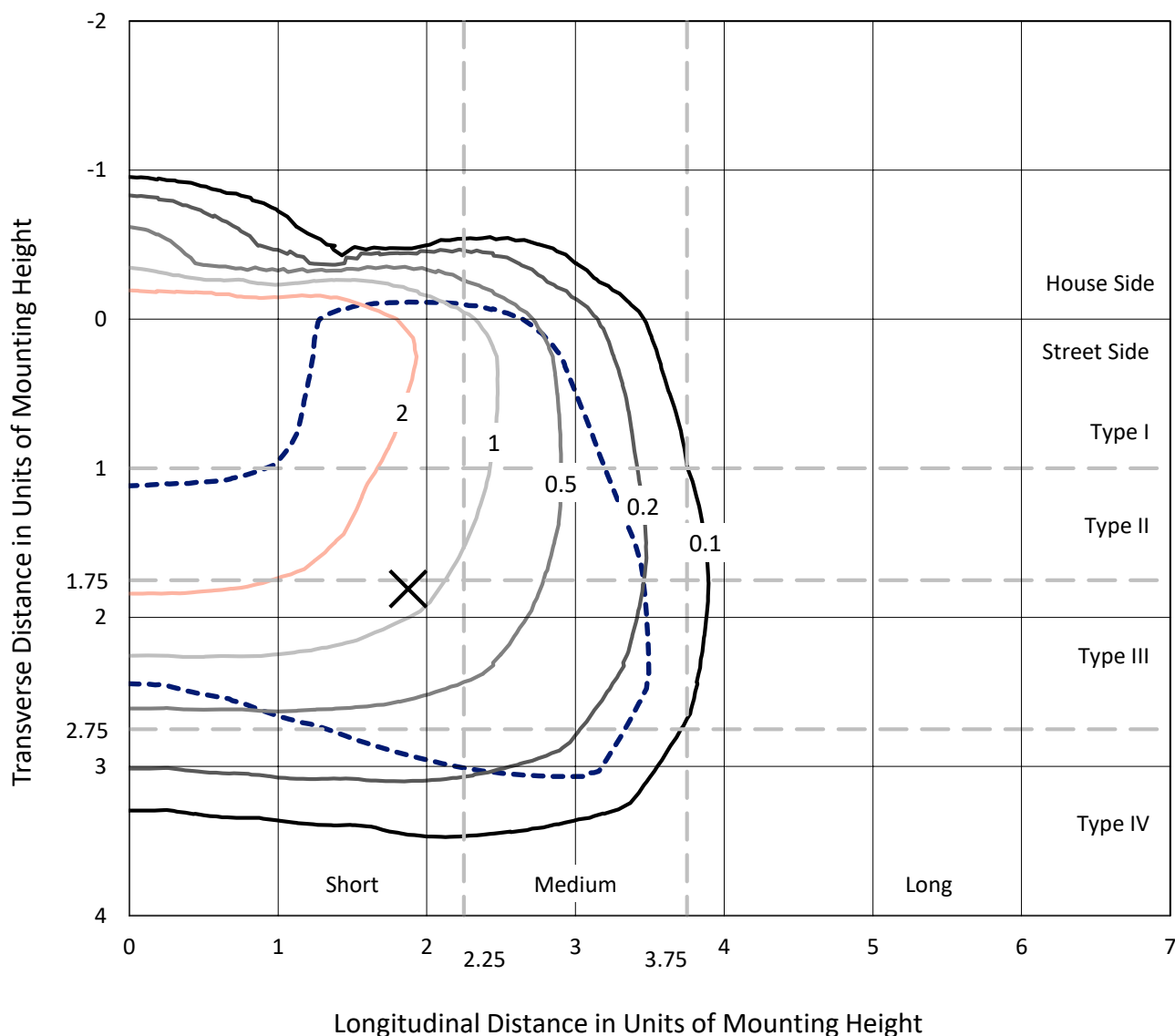
Input Watts (W): 320  
Input Voltage (V): NR  
Input Current (Ain): NR  
Voltage Rise (V): NR  
Power Factor: NR  
Total Harmonic Distortion (THDi): NR  
Frequency (hertz): 60  
Stabilization Time: NR  
Operation Time: NR  
Ambient Temperature (°C): NR  
Test Distance: 24 FT



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## Iso-Footcandle Lines of Horizontal Illumination

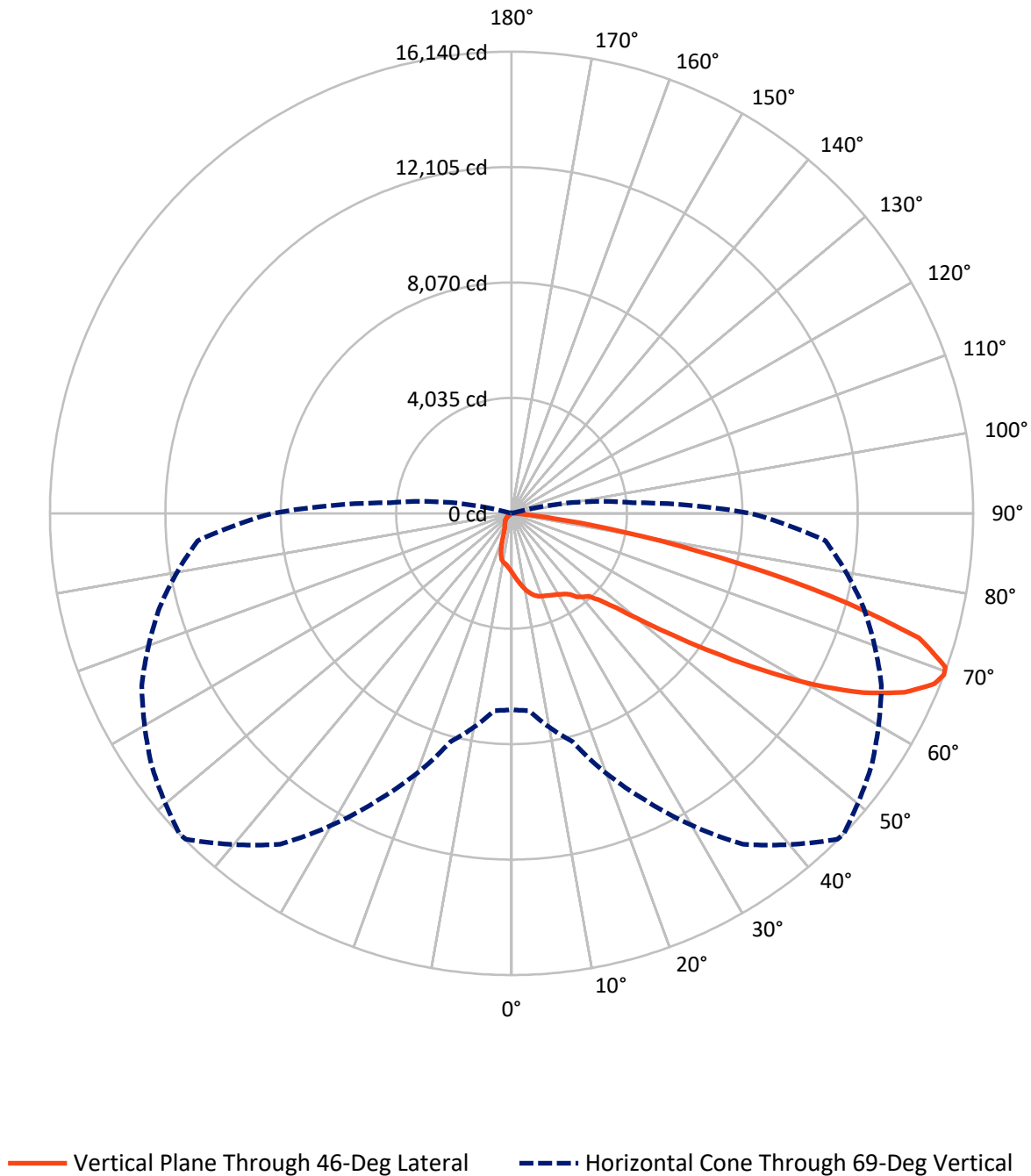
✕ Max cd  
 - - - 1/2 Max cd



Based on 25 foot mounting height. Maximum calculated value = 4.8 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    | 2120.6   | 0.0    | 2120.6  |
|                    | % Fixture | 10.3     | 0.0    | 10.3    |
| <b>Street Side</b> | Lumens    | 18542.4  | 0.0    | 18542.4 |
|                    | % Fixture | 89.7     | 0.0    | 89.7    |
| <b>Total</b>       | Lumens    | 20663.0  | 0.0    | 20663.0 |
|                    | % Fixture | 100.0    | 0.0    | 100.0   |

**ZONAL LUMENS:**

| Zone      | Lumens  | % Fixture |
|-----------|---------|-----------|
| 0°-10°    | 206.1   | 1.0       |
| 10°-20°   | 625.2   | 3.0       |
| 20°-30°   | 983.2   | 4.8       |
| 30°-40°   | 1409.9  | 6.8       |
| 40°-50°   | 2436.8  | 11.8      |
| 50°-60°   | 4814.2  | 23.3      |
| 60°-70°   | 6728.3  | 32.6      |
| 70°-80°   | 3250.5  | 15.7      |
| 80°-90°   | 208.9   | 1.0       |
| 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°    | 20663.0 | 100.0     |
| 0°-180°   | 20663.0 | 100.0     |

**Coefficient of Utilization**



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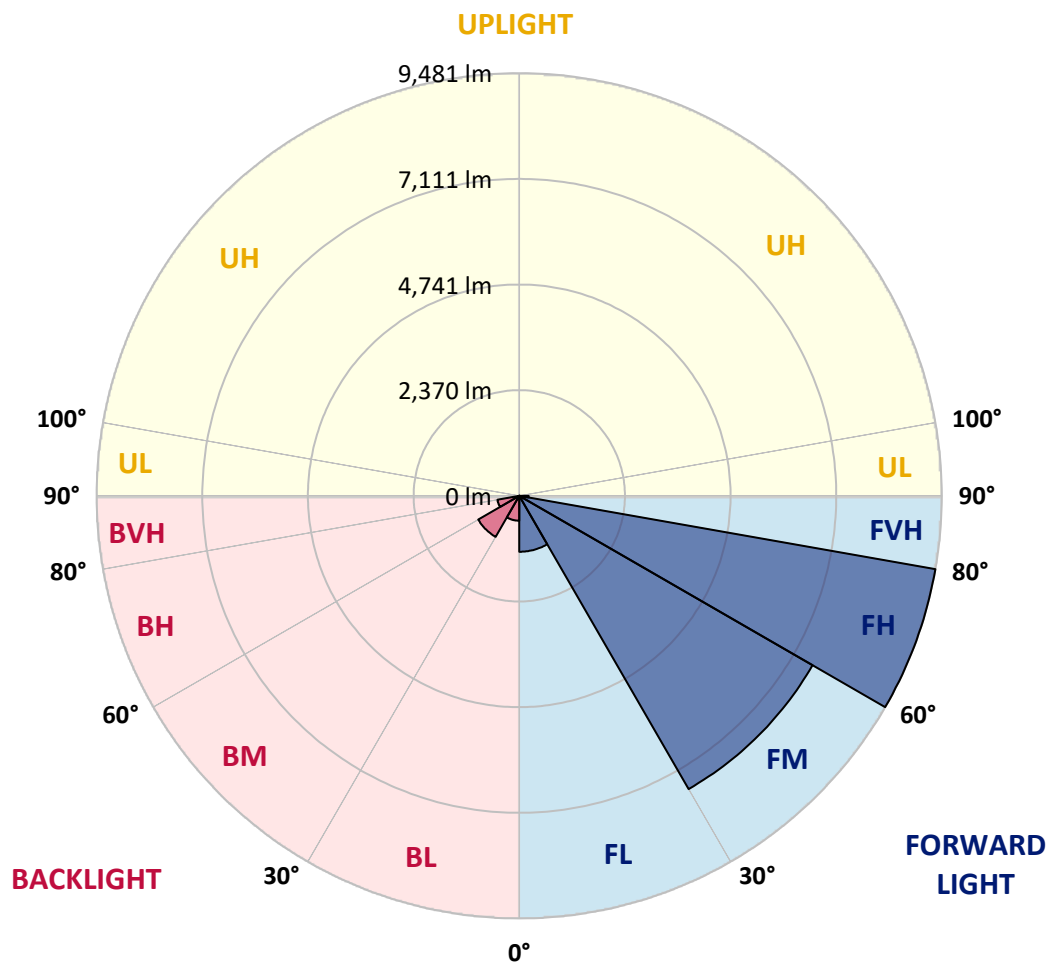
CATALOG NUMBER: GLEON-SA5D-827-U-T4W-HSS

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

| Zone |             | Lumens | % Fixture | Zone Rating/Lumen Limit |      |          |
|------|-------------|--------|-----------|-------------------------|------|----------|
|      |             |        |           | B                       | U    | G        |
| FL   | (0°-30°)    | 1255.5 | 6.1       |                         |      |          |
| FM   | (30°-60°)   | 7598.2 | 36.8      |                         |      |          |
| FH   | (60°-80°)   | 9481.5 | 45.9      |                         |      | G4/12000 |
| FVH  | (80°-90°)   | 207.2  | 1.0       |                         |      | G2/225   |
| BL   | (0°-30°)    | 558.9  | 2.7       | B2/1000                 |      |          |
| BM   | (30°-60°)   | 1062.7 | 5.1       | B2/2500                 |      |          |
| BH   | (60°-80°)   | 497.2  | 2.4       | B1/500                  |      | G1/500   |
| BVH  | (80°-90°)   | 1.8    | 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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**CANDELA DISTRIBUTION (FULL):**

|       | 0°      | 5°      | 15°     | 25°     | 35°     | 45°     | 46°     | 55°     | 65°     | 75°     | 85°     |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0°    | 2070.4  | 2070.4  | 2070.4  | 2070.4  | 2070.4  | 2070.4  | 2070.4  | 2070.4  | 2070.4  | 2070.4  | 2070.4  |
| 2.5°  | 2300.0  | 2297.1  | 2283.5  | 2277.7  | 2244.7  | 2225.4  | 2217.6  | 2193.4  | 2158.5  | 2123.6  | 2084.9  |
| 5°    | 2561.5  | 2560.6  | 2535.4  | 2511.2  | 2449.2  | 2391.0  | 2380.4  | 2324.2  | 2245.7  | 2172.1  | 2098.5  |
| 7.5°  | 2828.9  | 2816.3  | 2791.2  | 2744.6  | 2654.6  | 2561.5  | 2552.8  | 2473.4  | 2362.0  | 2255.4  | 2149.8  |
| 10°   | 3055.6  | 3047.9  | 3014.9  | 2944.2  | 2838.6  | 2733.0  | 2722.4  | 2624.5  | 2498.6  | 2367.8  | 2233.1  |
| 12.5° | 3232.0  | 3226.2  | 3182.6  | 3094.4  | 2982.0  | 2872.5  | 2858.0  | 2770.8  | 2636.1  | 2489.9  | 2331.0  |
| 15°   | 3339.5  | 3336.6  | 3283.3  | 3189.3  | 3078.9  | 2983.9  | 2971.4  | 2894.8  | 2769.8  | 2616.8  | 2437.5  |
| 17.5° | 3364.7  | 3365.7  | 3310.4  | 3215.5  | 3124.4  | 3056.6  | 3046.9  | 2988.8  | 2884.2  | 2732.1  | 2544.1  |
| 20°   | 3308.5  | 3320.1  | 3270.7  | 3188.4  | 3132.2  | 3096.3  | 3088.6  | 3053.7  | 2965.5  | 2822.2  | 2629.4  |
| 22.5° | 3229.1  | 3234.9  | 3201.0  | 3145.7  | 3122.5  | 3129.3  | 3125.4  | 3106.0  | 3031.4  | 2899.7  | 2713.6  |
| 25°   | 3180.6  | 3180.6  | 3160.3  | 3113.8  | 3129.3  | 3170.9  | 3171.9  | 3168.0  | 3108.9  | 2994.6  | 2816.3  |
| 27.5° | 3178.7  | 3172.9  | 3149.6  | 3114.7  | 3157.4  | 3221.3  | 3225.2  | 3251.3  | 3214.5  | 3109.9  | 2944.2  |
| 30°   | 3256.2  | 3249.4  | 3200.0  | 3154.5  | 3208.7  | 3277.5  | 3287.2  | 3344.3  | 3325.9  | 3234.9  | 3086.6  |
| 32.5° | 3437.4  | 3413.1  | 3303.7  | 3229.1  | 3269.7  | 3352.1  | 3364.7  | 3455.8  | 3484.8  | 3388.9  | 3224.2  |
| 35°   | 3685.4  | 3608.8  | 3450.9  | 3370.5  | 3374.4  | 3460.6  | 3472.2  | 3605.9  | 3692.1  | 3530.4  | 3330.8  |
| 37.5° | 4027.4  | 3989.6  | 3732.8  | 3517.8  | 3535.2  | 3666.0  | 3699.9  | 3845.2  | 3821.0  | 3607.9  | 3451.9  |
| 40°   | 4777.2  | 4718.1  | 4444.9  | 3930.5  | 3689.2  | 3832.6  | 3843.3  | 3920.8  | 3922.7  | 3783.2  | 3703.8  |
| 42.5° | 5798.4  | 5774.1  | 5486.4  | 4679.4  | 3992.5  | 3944.0  | 3963.4  | 4094.2  | 4240.5  | 4153.3  | 4149.4  |
| 45°   | 6929.0  | 6916.4  | 6611.2  | 5673.4  | 4605.7  | 4309.3  | 4333.5  | 4508.9  | 4788.8  | 4808.2  | 4931.3  |
| 47.5° | 7838.7  | 7832.9  | 7657.5  | 6782.7  | 5544.5  | 4928.4  | 4936.1  | 5122.1  | 5614.3  | 5857.4  | 6054.1  |
| 50°   | 8668.0  | 8696.1  | 8557.5  | 7983.0  | 6823.4  | 5898.1  | 5879.7  | 6003.7  | 6794.3  | 7192.5  | 7436.6  |
| 52.5° | 9820.9  | 9860.6  | 9472.1  | 9103.0  | 8165.2  | 7101.4  | 7086.9  | 7216.7  | 8212.6  | 8511.0  | 8554.6  |
| 55°   | 10839.1 | 10771.3 | 10464.2 | 10357.6 | 9801.5  | 8587.6  | 8583.7  | 8698.0  | 9584.5  | 9711.4  | 9791.8  |
| 57.5° | 11288.6 | 11262.5 | 11410.7 | 11654.8 | 11515.3 | 10344.0 | 10335.3 | 10248.1 | 10812.0 | 10825.5 | 11072.6 |
| 60°   | 11572.5 | 11604.5 | 12058.8 | 12811.6 | 13159.4 | 12234.2 | 12178.0 | 11646.1 | 11984.2 | 11954.2 | 12218.7 |
| 62.5° | 11359.3 | 11422.3 | 12240.0 | 13494.6 | 14389.8 | 13884.1 | 13804.6 | 12926.9 | 12986.0 | 12882.3 | 13128.4 |
| 65°   | 10227.8 | 10325.6 | 11665.5 | 13365.8 | 15000.1 | 15173.6 | 15093.2 | 14057.5 | 13781.4 | 13610.9 | 13474.3 |
| 67.5° | 8304.7  | 8362.8  | 9761.8  | 12244.8 | 14725.0 | 15942.8 | 15926.3 | 15048.6 | 14382.0 | 13487.8 | 12427.9 |
| 69°   | 6863.1  | 6920.2  | 8266.9  | 11064.8 | 14119.5 | 16107.5 | 16139.5 | 15366.4 | 14267.7 | 12739.9 | 11011.5 |
| 70°   | 5812.9  | 5873.9  | 7128.5  | 10053.4 | 13417.1 | 16031.0 | 16088.1 | 15336.3 | 13940.3 | 11873.8 | 9768.6  |
| 72.5° | 3048.9  | 3101.2  | 4388.7  | 6926.1  | 10937.9 | 14720.2 | 14893.6 | 14040.1 | 11816.6 | 8623.4  | 5776.1  |
| 75°   | 958.2   | 988.2   | 1713.8  | 3620.5  | 7488.9  | 11445.6 | 11485.3 | 11013.5 | 8390.9  | 4743.3  | 2405.6  |
| 77.5° | 365.2   | 356.5   | 570.6   | 1334.1  | 3786.1  | 7207.0  | 7450.2  | 6882.5  | 4403.3  | 1677.0  | 555.1   |
| 80°   | 196.7   | 197.6   | 296.5   | 552.2   | 1619.9  | 3703.8  | 3909.2  | 3335.6  | 1564.6  | 523.2   | 127.9   |
| 82.5° | 85.3    | 89.1    | 166.6   | 292.6   | 744.0   | 1366.0  | 1468.7  | 1222.6  | 597.8   | 351.7   | 47.5    |
| 85°   | 18.4    | 20.3    | 80.4    | 158.9   | 303.2   | 383.7   | 402.1   | 396.2   | 380.7   | 273.2   | 18.4    |
| 87.5° | 0.0     | 0.0     | 35.8    | 57.2    | 76.5    | 87.2    | 76.5    | 99.8    | 210.2   | 184.1   | 9.7     |
| 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: P323019

CATALOG NUMBER: GLEON-SA5D-827-U-T4W-HSS

**CANDELA DISTRIBUTION (continued):**

|       | 90°     | 95°    | 105°   | 115°   | 125°   | 135°   | 145°   | 155°   | 165°   | 175°   | 180°   |
|-------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0°    | 2070.4  | 2070.4 | 2070.4 | 2070.4 | 2070.4 | 2070.4 | 2070.4 | 2070.4 | 2070.4 | 2070.4 | 2070.4 |
| 2.5°  | 2072.3  | 2054.9 | 2024.8 | 1991.9 | 1968.6 | 1944.4 | 1925.0 | 1916.3 | 1906.6 | 1899.8 | 1908.6 |
| 5°    | 2068.4  | 2034.5 | 1976.4 | 1920.2 | 1879.5 | 1846.6 | 1819.4 | 1808.8 | 1798.1 | 1790.4 | 1789.4 |
| 7.5°  | 2102.3  | 2054.9 | 1965.7 | 1883.4 | 1820.4 | 1775.8 | 1739.0 | 1723.5 | 1710.9 | 1705.1 | 1700.3 |
| 10°   | 2167.2  | 2106.2 | 1987.0 | 1879.5 | 1798.1 | 1722.6 | 1643.1 | 1582.1 | 1542.4 | 1523.9 | 1517.2 |
| 12.5° | 2251.5  | 2175.0 | 2027.7 | 1899.8 | 1781.6 | 1636.3 | 1467.8 | 1322.4 | 1228.5 | 1197.5 | 1179.0 |
| 15°   | 2350.3  | 2255.4 | 2081.0 | 1926.0 | 1721.6 | 1456.1 | 1170.3 | 980.4  | 893.2  | 875.8  | 856.4  |
| 17.5° | 2445.3  | 2340.7 | 2145.0 | 1930.8 | 1589.8 | 1163.5 | 857.4  | 728.5  | 694.6  | 706.3  | 709.2  |
| 20°   | 2528.6  | 2424.9 | 2207.9 | 1888.2 | 1350.5 | 872.9  | 663.6  | 631.7  | 644.3  | 666.5  | 670.4  |
| 22.5° | 2612.9  | 2506.3 | 2266.1 | 1775.8 | 1044.4 | 662.7  | 597.8  | 605.5  | 618.1  | 640.4  | 644.3  |
| 25°   | 2715.6  | 2605.1 | 2320.3 | 1569.5 | 783.8  | 563.8  | 567.7  | 579.4  | 591.9  | 612.3  | 614.2  |
| 27.5° | 2833.8  | 2730.1 | 2356.2 | 1301.1 | 581.3  | 518.3  | 530.9  | 548.3  | 560.9  | 580.3  | 584.2  |
| 30°   | 2990.7  | 2894.8 | 2367.8 | 1023.1 | 487.3  | 477.6  | 483.4  | 504.8  | 523.2  | 540.6  | 543.5  |
| 32.5° | 3138.0  | 3057.6 | 2329.0 | 772.1  | 451.5  | 439.8  | 439.8  | 452.4  | 473.8  | 490.2  | 494.1  |
| 35°   | 3273.6  | 3221.3 | 2205.0 | 564.8  | 424.3  | 405.0  | 395.3  | 395.3  | 408.8  | 422.4  | 426.3  |
| 37.5° | 3452.9  | 3450.9 | 2004.5 | 450.5  | 398.2  | 375.9  | 355.6  | 340.1  | 335.2  | 338.1  | 340.1  |
| 40°   | 3760.0  | 3762.9 | 1742.9 | 404.0  | 375.9  | 345.9  | 314.9  | 286.8  | 260.6  | 251.9  | 250.9  |
| 42.5° | 4239.5  | 4195.9 | 1468.7 | 381.7  | 356.5  | 314.9  | 268.4  | 230.6  | 189.9  | 177.3  | 176.3  |
| 45°   | 5001.0  | 4742.3 | 1178.1 | 361.4  | 336.2  | 280.0  | 221.9  | 170.5  | 137.6  | 127.9  | 127.9  |
| 47.5° | 6110.3  | 5460.2 | 912.6  | 339.1  | 309.1  | 240.3  | 167.6  | 123.0  | 100.8  | 95.9   | 96.9   |
| 50°   | 7257.4  | 6163.6 | 699.5  | 311.0  | 276.1  | 198.6  | 124.0  | 89.1   | 76.5   | 76.5   | 77.5   |
| 52.5° | 8274.6  | 6679.0 | 545.4  | 281.0  | 235.4  | 156.0  | 94.0   | 69.8   | 63.9   | 63.0   | 63.9   |
| 55°   | 9227.0  | 7011.3 | 417.6  | 246.1  | 187.0  | 116.3  | 71.7   | 57.2   | 53.3   | 51.3   | 50.4   |
| 57.5° | 10145.4 | 7176.0 | 312.9  | 198.6  | 135.6  | 84.3   | 57.2   | 48.4   | 44.6   | 41.7   | 40.7   |
| 60°   | 10756.7 | 7042.3 | 215.1  | 146.3  | 94.0   | 61.0   | 47.5   | 41.7   | 36.8   | 33.9   | 32.9   |
| 62.5° | 11101.6 | 6677.1 | 138.5  | 105.6  | 66.8   | 45.5   | 37.8   | 34.9   | 28.1   | 25.2   | 25.2   |
| 65°   | 10962.1 | 6074.5 | 96.9   | 75.6   | 48.4   | 33.9   | 28.1   | 28.1   | 20.3   | 16.5   | 15.5   |
| 67.5° | 9714.3  | 5131.8 | 73.6   | 56.2   | 34.9   | 25.2   | 21.3   | 24.2   | 12.6   | 7.8    | 7.8    |
| 69°   | 8358.0  | 4253.1 | 63.0   | 46.5   | 29.1   | 20.3   | 18.4   | 22.3   | 8.7    | 5.8    | 4.8    |
| 70°   | 7264.2  | 3668.9 | 57.2   | 40.7   | 24.2   | 17.4   | 16.5   | 21.3   | 8.7    | 4.8    | 3.9    |
| 72.5° | 4346.1  | 2046.1 | 43.6   | 29.1   | 15.5   | 13.6   | 13.6   | 24.2   | 8.7    | 4.8    | 3.9    |
| 75°   | 1756.5  | 720.8  | 32.0   | 20.3   | 11.6   | 11.6   | 16.5   | 31.0   | 7.8    | 3.9    | 2.9    |
| 77.5° | 398.2   | 157.9  | 18.4   | 12.6   | 7.8    | 11.6   | 19.4   | 24.2   | 4.8    | 1.9    | 0.0    |
| 80°   | 96.9    | 38.8   | 11.6   | 7.8    | 4.8    | 8.7    | 14.5   | 13.6   | 1.0    | 0.0    | 0.0    |
| 82.5° | 32.0    | 13.6   | 4.8    | 3.9    | 1.0    | 2.9    | 6.8    | 3.9    | 0.0    | 0.0    | 0.0    |
| 85°   | 13.6    | 7.8    | 1.9    | 1.0    | 0.0    | 0.0    | 1.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 87.5° | 8.7     | 2.9    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |
| 90°   | 0.0     | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |

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

Report Prepared for

Cooper Lighting Solutions

Invue

Report Number: SP1-2407-157-9

Test Date: 10/03/2024

Luminaire Tested: EMM2-HTN-SA1A-827-U-5WQ

Data applicable to all product families utilizing light square engine

### Test Information

Test Method: LM-79-2019  
 Report Number: SP1-2407-157-9  
 Test Lab: COOPER LIGHTING SOLUTIONS  
 Photometer: SP1 - 76IN SPHERE  
 Measurement Geometry:  $4\pi$   
 Issue Date: 10/03/2024  
 Manufacturer: COOPER LIGHTING SOLUTIONS  
 Product Line: Invue  
 Catalog Number: **EMM2-HTN-SA1A-827-U-5WQ**  
 Description: Epic Modern Light Square 40W 5WQ Optic

### Spectral Parameters

CCT (K): 2764  
 CIE  $u'$ : 0.2591  
 CIE  $v'$ : 0.5290  
 Duv: 0.0020  
 CIE x: 0.4581  
 CIE y: 0.4156  
 CIE z: 0.1263  
 Peak Wavelength (nm): 603  
 Dominant Wavelength (nm): 583  
 Purity: 62.2537  
 R<sub>f</sub>: 84.7  
 R<sub>g</sub>: 94.6

CRI (Ra): 80.9  
 R1: 78.8  
 R2: 89.9  
 R3: 96.2  
 R4: 79.1  
 R5: 79.1  
 R6: 88.8  
 R7: 81.3  
 R8: 54.3  
 R9: -1.5  
 R10: 77.9  
 R11: 78.9  
 R12: 71.6  
 R13: 81.2  
 R14: 98.5  
 R15: 69.9



### Test Conditions

Stabilization Time: 81M  
 Operation Time: 2H 21M  
 Sphere Temperature (°C): 25.2

REPORT NUMBER: SP1-2407-157-9

| Measurement and Test Equipment |                       |                  |                      |
|--------------------------------|-----------------------|------------------|----------------------|
| Instrument                     | Identification Number | Calibration Date | Calibration Due Date |
| Photometer                     | IN0058                | 6/18/2024        | 12/18/2024           |
| Power Meter                    | INXT2011004           | 2/8/2024         | 2/8/2025             |
| AC Power Source                | IN0063                | 10/24/2023       | 10/24/2024           |
| DC Power Source                | IN0208                | 10/24/2023       | 10/24/2024           |
| Sphere Thermometer             | IN0085                | 10/24/2023       | 10/24/2024           |
| Room Thermometer               | IN0046                | 10/24/2023       | 10/24/2024           |

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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 2700K 4-step quadrangle

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### Photopic Flux vs. Wavelength



### Photopic Lumens: 4337.9

| λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (φ/nm) | λ (nm) | Power (μW/nm) | Lumens (φ/nm) |
|--------|---------------|---------------|--------|---------------|---------------|--------|---------------|---------------|--------|---------------|---------------|--------|---------------|---------------|
| 360    | 0             | 0.0           | 490    | 18018         | 2.6           | 620    | 87426         | 22.8          | 750    | 2680          | 0.0           | 880    | 58            | 0.0           |
| 365    | 0             | 0.0           | 495    | 22295         | 3.9           | 625    | 83013         | 18.2          | 755    | 2287          | 0.0           | 885    | 46            | 0.0           |
| 370    | 0             | 0.0           | 500    | 26478         | 5.8           | 630    | 78077         | 14.1          | 760    | 1944          | 0.0           | 890    | 45            | 0.0           |
| 375    | 0             | 0.0           | 505    | 30524         | 8.5           | 635    | 72080         | 10.7          | 765    | 1653          | 0.0           | 895    | 41            | 0.0           |
| 380    | 0             | 0.0           | 510    | 33611         | 11.5          | 640    | 66249         | 7.9           | 770    | 1413          | 0.0           | 900    | 38            | 0.0           |
| 385    | 0             | 0.0           | 515    | 36490         | 15.2          | 645    | 59973         | 5.7           | 775    | 1198          | 0.0           | 905    | 33            | 0.0           |
| 390    | 0             | 0.0           | 520    | 38610         | 18.7          | 650    | 53972         | 3.9           | 780    | 1025          | 0.0           | 910    | 30            | 0.0           |
| 395    | 0             | 0.0           | 525    | 40511         | 21.9          | 655    | 48369         | 2.7           | 785    | 874           | 0.0           | 915    | 23            | 0.0           |
| 400    | 48            | 0.0           | 530    | 42223         | 24.9          | 660    | 42641         | 1.8           | 790    | 747           | 0.0           | 920    | 24            | 0.0           |
| 405    | 201           | 0.0           | 535    | 44137         | 27.6          | 665    | 37602         | 1.1           | 795    | 639           | 0.0           | 925    | 22            | 0.0           |
| 410    | 457           | 0.0           | 540    | 46032         | 30.0          | 670    | 32798         | 0.7           | 800    | 547           | 0.0           | 930    | 22            | 0.0           |
| 415    | 925           | 0.0           | 545    | 48553         | 32.5          | 675    | 28558         | 0.5           | 805    | 473           | 0.0           | 935    | 17            | 0.0           |
| 420    | 1816          | 0.0           | 550    | 51408         | 34.9          | 680    | 24782         | 0.3           | 810    | 401           | 0.0           | 940    | 13            | 0.0           |
| 425    | 3217          | 0.0           | 555    | 54711         | 37.4          | 685    | 21386         | 0.2           | 815    | 351           | 0.0           | 945    | 6             | 0.0           |
| 430    | 5520          | 0.0           | 560    | 58847         | 40.0          | 690    | 18413         | 0.1           | 820    | 307           | 0.0           | 950    | 10            | 0.0           |
| 435    | 9225          | 0.1           | 565    | 63386         | 42.4          | 695    | 15721         | 0.1           | 825    | 261           | 0.0           | 955    | 11            | 0.0           |
| 440    | 15522         | 0.2           | 570    | 68196         | 44.3          | 700    | 13432         | 0.0           | 830    | 228           | 0.0           | 960    | 8             | 0.0           |
| 445    | 27642         | 0.6           | 575    | 73613         | 46.0          | 705    | 11513         | 0.0           | 835    | 193           | 0.0           | 965    | 12            | 0.0           |
| 450    | 36602         | 0.9           | 580    | 79207         | 47.1          | 710    | 9780          | 0.0           | 840    | 174           | 0.0           | 970    | 3             | 0.0           |
| 455    | 28292         | 0.9           | 585    | 84248         | 47.0          | 715    | 8356          | 0.0           | 845    | 151           | 0.0           | 975    | 8             | 0.0           |
| 460    | 21166         | 0.9           | 590    | 88397         | 45.7          | 720    | 7161          | 0.0           | 850    | 123           | 0.0           | 980    | 2             | 0.0           |
| 465    | 19092         | 1.0           | 595    | 91428         | 43.4          | 725    | 6067          | 0.0           | 855    | 106           | 0.0           | 985    | 13            | 0.0           |
| 470    | 14951         | 0.9           | 600    | 93452         | 40.3          | 730    | 5164          | 0.0           | 860    | 95            | 0.0           | 990    | 16            | 0.0           |
| 475    | 12606         | 1.0           | 605    | 93959         | 36.4          | 735    | 4393          | 0.0           | 865    | 82            | 0.0           | 995    | 20            | 0.0           |
| 480    | 13323         | 1.3           | 610    | 93079         | 32.0          | 740    | 3694          | 0.0           | 870    | 77            | 0.0           | 1000   | 0             | 0.0           |
| 485    | 15164         | 1.8           | 615    | 90707         | 27.3          | 745    | 3157          | 0.0           | 875    | 65            | 0.0           |        |               |               |

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### Scotopic Flux vs. Wavelength



Scotopic Lumens: 5286.7

S/P: 1.22

| 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       | 0                | 0.0              | 490       | 18018            | 75.9             | 620       | 87426            | 0.4              | 750       | 2680             | 0.0              | 880       | 58               | 0.0              |
| 365       | 0                | 0.0              | 495       | 22295            | 93.2             | 625       | 83013            | 0.2              | 755       | 2287             | 0.0              | 885       | 46               | 0.0              |
| 370       | 0                | 0.0              | 500       | 26478            | 107.8            | 630       | 78077            | 0.1              | 760       | 1944             | 0.0              | 890       | 45               | 0.0              |
| 375       | 0                | 0.0              | 505       | 30524            | 118.7            | 635       | 72080            | 0.1              | 765       | 1653             | 0.0              | 895       | 41               | 0.0              |
| 380       | 0                | 0.0              | 510       | 33611            | 122.2            | 640       | 66249            | 0.1              | 770       | 1413             | 0.0              | 900       | 38               | 0.0              |
| 385       | 0                | 0.0              | 515       | 36490            | 120.8            | 645       | 59973            | 0.0              | 775       | 1198             | 0.0              | 905       | 33               | 0.0              |
| 390       | 0                | 0.0              | 520       | 38610            | 113.9            | 650       | 53972            | 0.0              | 780       | 1025             | 0.0              | 910       | 30               | 0.0              |
| 395       | 0                | 0.0              | 525       | 40511            | 104.1            | 655       | 48369            | 0.0              | 785       | 874              | 0.0              | 915       | 23               | 0.0              |
| 400       | 48               | 0.0              | 530       | 42223            | 92.4             | 660       | 42641            | 0.0              | 790       | 747              | 0.0              | 920       | 24               | 0.0              |
| 405       | 201              | 0.0              | 535       | 44137            | 80.5             | 665       | 37602            | 0.0              | 795       | 639              | 0.0              | 925       | 22               | 0.0              |
| 410       | 457              | 0.1              | 540       | 46032            | 68.2             | 670       | 32798            | 0.0              | 800       | 547              | 0.0              | 930       | 22               | 0.0              |
| 415       | 925              | 0.3              | 545       | 48553            | 57.1             | 675       | 28558            | 0.0              | 805       | 473              | 0.0              | 935       | 17               | 0.0              |
| 420       | 1816             | 1.1              | 550       | 51408            | 46.7             | 680       | 24782            | 0.0              | 810       | 401              | 0.0              | 940       | 13               | 0.0              |
| 425       | 3217             | 2.5              | 555       | 54711            | 37.4             | 685       | 21386            | 0.0              | 815       | 351              | 0.0              | 945       | 6                | 0.0              |
| 430       | 5520             | 5.9              | 560       | 58847            | 29.4             | 690       | 18413            | 0.0              | 820       | 307              | 0.0              | 950       | 10               | 0.0              |
| 435       | 9225             | 12.5             | 565       | 63386            | 22.5             | 695       | 15721            | 0.0              | 825       | 261              | 0.0              | 955       | 11               | 0.0              |
| 440       | 15522            | 26.3             | 570       | 68196            | 16.9             | 700       | 13432            | 0.0              | 830       | 228              | 0.0              | 960       | 8                | 0.0              |
| 445       | 27642            | 55.2             | 575       | 73613            | 12.4             | 705       | 11513            | 0.0              | 835       | 193              | 0.0              | 965       | 12               | 0.0              |
| 450       | 36602            | 85.4             | 580       | 79207            | 9.0              | 710       | 9780             | 0.0              | 840       | 174              | 0.0              | 970       | 3                | 0.0              |
| 455       | 28292            | 75.1             | 585       | 84248            | 6.3              | 715       | 8356             | 0.0              | 845       | 151              | 0.0              | 975       | 8                | 0.0              |
| 460       | 21166            | 63.2             | 590       | 88397            | 4.4              | 720       | 7161             | 0.0              | 850       | 123              | 0.0              | 980       | 2                | 0.0              |
| 465       | 19092            | 63.2             | 595       | 91428            | 3.0              | 725       | 6067             | 0.0              | 855       | 106              | 0.0              | 985       | 13               | 0.0              |
| 470       | 14951            | 54.2             | 600       | 93452            | 2.0              | 730       | 5164             | 0.0              | 860       | 95               | 0.0              | 990       | 16               | 0.0              |
| 475       | 12606            | 48.8             | 605       | 93959            | 1.3              | 735       | 4393             | 0.0              | 865       | 82               | 0.0              | 995       | 20               | 0.0              |
| 480       | 13323            | 54.2             | 610       | 93079            | 0.9              | 740       | 3694             | 0.0              | 870       | 77               | 0.0              | 1000      | 0                | 0.0              |
| 485       | 15164            | 63.3             | 615       | 90707            | 0.5              | 745       | 3157             | 0.0              | 875       | 65               | 0.0              |           |                  |                  |

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**Melanopic Flux vs. Wavelength**



**Melanopic Lumens: 9797**

**M/P: 2.26**

| 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       | 0                | 0.0              | 490       | 18018            | 27.7             | 620       | 87426            | 1.1              | 750       | 2680             | 0.0              | 880       | 58               | 0.0              |
| 365       | 0                | 0.0              | 495       | 22295            | 36.0             | 625       | 83013            | 0.7              | 755       | 2287             | 0.0              | 885       | 46               | 0.0              |
| 370       | 0                | 0.0              | 500       | 26478            | 44.2             | 630       | 78077            | 0.4              | 760       | 1944             | 0.0              | 890       | 45               | 0.0              |
| 375       | 0                | 0.0              | 505       | 30524            | 51.8             | 635       | 72080            | 0.3              | 765       | 1653             | 0.0              | 895       | 41               | 0.0              |
| 380       | 0                | 0.0              | 510       | 33611            | 57.0             | 640       | 66249            | 0.2              | 770       | 1413             | 0.0              | 900       | 38               | 0.0              |
| 385       | 0                | 0.0              | 515       | 36490            | 60.5             | 645       | 59973            | 0.1              | 775       | 1198             | 0.0              | 905       | 33               | 0.0              |
| 390       | 0                | 0.0              | 520       | 38610            | 61.4             | 650       | 53972            | 0.1              | 780       | 1025             | 0.0              | 910       | 30               | 0.0              |
| 395       | 0                | 0.0              | 525       | 40511            | 60.6             | 655       | 48369            | 0.0              | 785       | 874              | 0.0              | 915       | 23               | 0.0              |
| 400       | 48               | 0.0              | 530       | 42223            | 58.2             | 660       | 42641            | 0.0              | 790       | 747              | 0.0              | 920       | 24               | 0.0              |
| 405       | 201              | 0.0              | 535       | 44137            | 55.0             | 665       | 37602            | 0.0              | 795       | 639              | 0.0              | 925       | 22               | 0.0              |
| 410       | 457              | 0.0              | 540       | 46032            | 50.9             | 670       | 32798            | 0.0              | 800       | 547              | 0.0              | 930       | 22               | 0.0              |
| 415       | 925              | 0.1              | 545       | 48553            | 46.6             | 675       | 28558            | 0.0              | 805       | 473              | 0.0              | 935       | 17               | 0.0              |
| 420       | 1816             | 0.3              | 550       | 51408            | 42.0             | 680       | 24782            | 0.0              | 810       | 401              | 0.0              | 940       | 13               | 0.0              |
| 425       | 3217             | 0.8              | 555       | 54711            | 37.4             | 685       | 21386            | 0.0              | 815       | 351              | 0.0              | 945       | 6                | 0.0              |
| 430       | 5520             | 1.9              | 560       | 58847            | 32.9             | 690       | 18413            | 0.0              | 820       | 307              | 0.0              | 950       | 10               | 0.0              |
| 435       | 9225             | 4.1              | 565       | 63386            | 28.4             | 695       | 15721            | 0.0              | 825       | 261              | 0.0              | 955       | 11               | 0.0              |
| 440       | 15522            | 8.7              | 570       | 68196            | 24.1             | 700       | 13432            | 0.0              | 830       | 228              | 0.0              | 960       | 8                | 0.0              |
| 445       | 27642            | 18.5             | 575       | 73613            | 20.0             | 705       | 11513            | 0.0              | 835       | 193              | 0.0              | 965       | 12               | 0.0              |
| 450       | 36602            | 28.3             | 580       | 79207            | 16.3             | 710       | 9780             | 0.0              | 840       | 174              | 0.0              | 970       | 3                | 0.0              |
| 455       | 28292            | 24.7             | 585       | 84248            | 12.9             | 715       | 8356             | 0.0              | 845       | 151              | 0.0              | 975       | 8                | 0.0              |
| 460       | 21166            | 20.4             | 590       | 88397            | 9.8              | 720       | 7161             | 0.0              | 850       | 123              | 0.0              | 980       | 2                | 0.0              |
| 465       | 19092            | 20.1             | 595       | 91428            | 7.3              | 725       | 6067             | 0.0              | 855       | 106              | 0.0              | 985       | 13               | 0.0              |
| 470       | 14951            | 17.2             | 600       | 93452            | 5.3              | 730       | 5164             | 0.0              | 860       | 95               | 0.0              | 990       | 16               | 0.0              |
| 475       | 12606            | 15.7             | 605       | 93959            | 3.7              | 735       | 4393             | 0.0              | 865       | 82               | 0.0              | 995       | 20               | 0.0              |
| 480       | 13323            | 18.0             | 610       | 93079            | 2.5              | 740       | 3694             | 0.0              | 870       | 77               | 0.0              | 1000      | 0                | 0.0              |
| 485       | 15164            | 21.9             | 615       | 90707            | 1.7              | 745       | 3157             | 0.0              | 875       | 65               | 0.0              |           |                  |                  |

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TM-30-18

### Summary

$R_f = 84.7$   
 $R_g = 94.6$   
 $CIE\ R_a = 80.9$   
 $R_g = -1.5$



### Color Vector Graphics



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

|            |            |            |            |
|------------|------------|------------|------------|
| CES01 = 86 | CES26 = 84 | CES51 = 95 | CES76 = 81 |
| CES02 = 63 | CES27 = 95 | CES52 = 94 | CES77 = 84 |
| CES03 = 31 | CES28 = 94 | CES53 = 89 | CES78 = 81 |
| CES04 = 71 | CES29 = 87 | CES54 = 91 | CES79 = 89 |
| CES05 = 50 | CES30 = 94 | CES55 = 90 | CES80 = 89 |
| CES06 = 52 | CES31 = 89 | CES56 = 86 | CES81 = 69 |
| CES07 = 43 | CES32 = 82 | CES57 = 85 | CES82 = 96 |
| CES08 = 41 | CES33 = 91 | CES58 = 86 | CES83 = 93 |
| CES09 = 29 | CES34 = 92 | CES59 = 91 | CES84 = 92 |
| CES10 = 77 | CES35 = 96 | CES60 = 94 | CES85 = 76 |
| CES11 = 60 | CES36 = 90 | CES61 = 89 | CES86 = 65 |
| CES12 = 66 | CES37 = 96 | CES62 = 94 | CES87 = 84 |
| CES13 = 44 | CES38 = 98 | CES63 = 87 | CES88 = 86 |
| CES14 = 74 | CES39 = 98 | CES64 = 82 | CES89 = 73 |
| CES15 = 72 | CES40 = 95 | CES65 = 78 | CES90 = 88 |
| CES16 = 48 | CES41 = 96 | CES66 = 81 | CES91 = 82 |
| CES17 = 50 | CES42 = 97 | CES67 = 80 | CES92 = 64 |
| CES18 = 57 | CES43 = 91 | CES68 = 83 | CES93 = 78 |
| CES19 = 73 | CES44 = 99 | CES69 = 88 | CES94 = 59 |
| CES20 = 67 | CES45 = 93 | CES70 = 80 | CES95 = 74 |
| CES21 = 87 | CES46 = 89 | CES71 = 79 | CES96 = 83 |
| CES22 = 79 | CES47 = 92 | CES72 = 92 | CES97 = 88 |
| CES23 = 92 | CES48 = 83 | CES73 = 75 | CES98 = 83 |
| CES24 = 91 | CES49 = 90 | CES74 = 91 | CES99 = 74 |
| CES25 = 72 | CES50 = 94 | CES75 = 81 |            |



**Color Rendition by Hue-Angle Bin**


**Measure Comparisons**



(END OF REPORT)