

REPORT NUMBER: RAB03414

ISSUE DATE: 05/23/17

PAGE: 1 OF 9
DATE SAMPLE TESTED: 05/23/17

CATALOG NUMBER: RAIL225NW/D10, RAILP225NW/D10 (Standard Distribution)

LUMINAIRE: EXTRUDED METAL HOUSING WITH HEAT SINK FINS, TWO WHITE CIRCUIT BOARD WITH THREE HUNDRED LEDS ON EACH BOARD, METAL REFLECTOR WITH SPECULAR FINISH, FLAT TRANSLUCENT LENS WITH FROSTED SIDE IN.

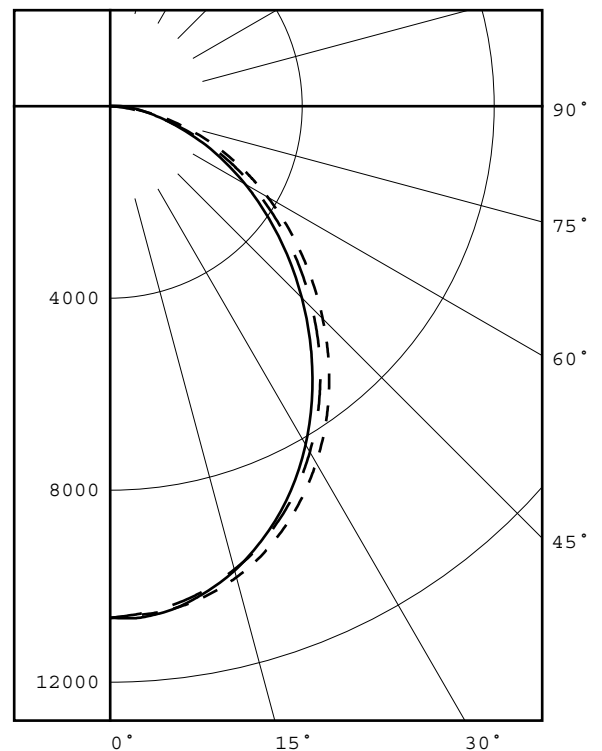
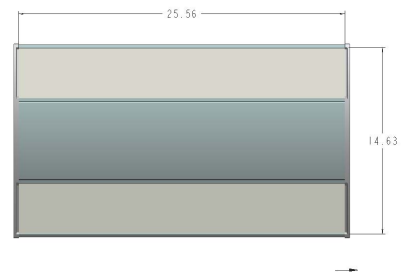
LAMPS: SIX HUNDRED LIGHT EMITTING DIODES (LEDs).

NOTE: THIS REPORT WITH THE USE OF THE NVLAP LOGO SHALL NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY NVLAP, NIST, OR ANY AGENCY OF THE FEDERAL GOVERNMENT.

(SEE PAGE 2 FOR MORE INFORMATION)

CANDELA DISTRIBUTION

| | 0.0 | 45.0 | 90.0 | 135.0 | 180.0 | FLUX |
|-----|-------|-------|-------|-------|-------|------|
| 0 | 10659 | 10659 | 10659 | 10659 | 10659 | |
| 5 | 10598 | 10614 | 10633 | 10579 | 10550 | 1006 |
| 15 | 10162 | 10104 | 10016 | 9999 | 9990 | 2830 |
| 25 | 9213 | 9071 | 8870 | 8893 | 8985 | 4130 |
| 35 | 7871 | 7634 | 7336 | 7422 | 7580 | 4704 |
| 45 | 6260 | 5983 | 5644 | 5761 | 5951 | 4531 |
| 55 | 4598 | 4327 | 4007 | 4118 | 4299 | 3783 |
| 65 | 3001 | 2787 | 2523 | 2592 | 2751 | 2676 |
| 75 | 1520 | 1410 | 1274 | 1258 | 1295 | 1428 |
| 85 | 322 | 440 | 498 | 371 | 185 | 454 |
| 90 | 19 | 184 | 250 | 135 | 2 | |
| 95 | 0 | 29 | 70 | 14 | 3 | 50 |
| 105 | 1 | 3 | 4 | 5 | 5 | 4 |
| 115 | 2 | 3 | 4 | 5 | 5 | 4 |
| 125 | 3 | 3 | 4 | 5 | 5 | 4 |
| 135 | 3 | 4 | 5 | 6 | 6 | 4 |
| 145 | 4 | 5 | 6 | 7 | 7 | 4 |
| 155 | 6 | 6 | 7 | 8 | 9 | 3 |
| 165 | 6 | 7 | 8 | 9 | 9 | 2 |
| 175 | 7 | 8 | 10 | 10 | 10 | 1 |
| 180 | 9 | 9 | 9 | 9 | 9 | |



LEGEND:
0-deg: - - - - -
90-deg: _____
180-deg: - - - - -

ZONAL LUMEN SUMMARY

| ZONE | LUMENS | %FIXT |
|--------|--------|-------|
| 0- 30 | 7965 | 31.1 |
| 0- 40 | 12669 | 49.5 |
| 0- 60 | 20983 | 81.9 |
| 0- 90 | 25541 | 99.7 |
| 90-120 | 57 | 0.2 |
| 90-130 | 61 | 0.2 |
| 90-150 | 69 | 0.3 |
| 90-180 | 75 | 0.3 |
| 0-180 | 25617 | 100.0 |

TOTAL INPUT WATTS = 199.3

EFFICACY = 128.5 Lm/W

CIE TYPE - DIRECT

PLANE : 0-DEG 90-DEG 180-DEG

SPACING CRITERIA : 1.2 1.1 1.2

Checked P. ALBERS
Approved D. WANG-MUNSON

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ADDITIONAL INFORMATION

NOTE: DATA SHOWN IS ABSOLUTE FOR THE SAMPLE PROVIDED.

TOTAL INPUT WATTS = 199.32 W AT 120.0 VAC.

LED DRIVER: 2 x RDD-096-A2450

TEST PROCEDURE: IESNA LM-79-08

LM-80 DATA AVAILABLE FROM MANUFACTURER FOR SOLID STATE SOURCE

AMBIENT: 25.0

ACCREDITED LABORATORY CODE 201058-0

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PLANE : 0-DEG 90-DEG

BEAM ANGLE (50%) : 99.2 X 93.6 DEGREES

FIELD ANGLE (10%): 155.1 X 154.1 DEGREES

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PLANE : 0-DEG 90-DEG
LUMINOUS LENGTH :25.560 14.630

LUMINANCE DATA IN CANDELA/SQ METER

| ANGLE IN DEG | AVERAGE 0-DEG | AVERAGE 90-DEG | AVERAGE 180-DEG |
|-----------------|------------------|-------------------|--------------------|
| 45 | 36683. | 33073. | 34872. |
| 55 | 33216. | 28947. | 31056. |
| 65 | 29423. | 24737. | 26972. |
| 75 | 24334. | 20396. | 20732. |
| 85 | 15308. | 23676. | 8795. |

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ZONAL LUMEN SUMMARY

| | |
|---------|-------|
| 0- 5 | 254. |
| 5- 10 | 751. |
| 10- 15 | 1213. |
| 15- 20 | 1617. |
| 20- 25 | 1945. |
| 25- 30 | 2185. |
| 30- 35 | 2328. |
| 35- 40 | 2375. |
| 40- 45 | 2329. |
| 45- 50 | 2202. |
| 50- 55 | 2011. |
| 55- 60 | 1772. |
| 60- 65 | 1491. |
| 65- 70 | 1185. |
| 70- 75 | 865. |
| 75- 80 | 563. |
| 80- 85 | 313. |
| 85- 90 | 142. |
| 90- 95 | 43. |
| 95-100 | 7. |
| 100-105 | 2. |
| 105-110 | 2. |
| 110-115 | 2. |
| 115-120 | 2. |
| 120-125 | 2. |
| 125-130 | 2. |
| 130-135 | 2. |
| 135-140 | 2. |
| 140-145 | 2. |
| 145-150 | 2. |
| 150-155 | 2. |
| 155-160 | 2. |
| 160-165 | 1. |
| 165-170 | 1. |
| 170-175 | 1. |
| 175-180 | 0. |

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5-DEGREE

ZONAL LUMEN SUMMARY

| | |
|---------|------|
| 0- 5 | 254 |
| 5- 10 | 751 |
| 10- 15 | 1213 |
| 15- 20 | 1617 |
| 20- 25 | 1945 |
| 25- 30 | 2185 |
| 30- 35 | 2328 |
| 35- 40 | 2375 |
| 40- 45 | 2329 |
| 45- 50 | 2202 |
| 50- 55 | 2011 |
| 55- 60 | 1772 |
| 60- 65 | 1491 |
| 65- 70 | 1185 |
| 70- 75 | 865 |
| 75- 80 | 563 |
| 80- 85 | 313 |
| 85- 90 | 142 |
| 90- 95 | 43 |
| 95-100 | 7 |
| 100-105 | 2 |
| 105-110 | 2 |
| 110-115 | 2 |
| 115-120 | 2 |
| 120-125 | 2 |
| 125-130 | 2 |
| 130-135 | 2 |
| 135-140 | 2 |
| 140-145 | 2 |
| 145-150 | 2 |
| 150-155 | 2 |
| 155-160 | 2 |
| 160-165 | 1 |
| 165-170 | 1 |
| 170-175 | 1 |
| 175-180 | 0 |

10-DEGREE

ZONAL LUMEN SUMMARY

| | |
|-------|-------|
| 0- 10 | 1006 |
| 0- 20 | 3835 |
| 0- 30 | 7965 |
| 0- 40 | 12669 |
| 0- 50 | 17200 |
| 0- 60 | 20983 |
| 0- 70 | 23659 |
| 0- 80 | 25087 |
| 0- 90 | 25541 |
| 0-100 | 25591 |
| 0-110 | 25595 |
| 0-120 | 25599 |
| 0-130 | 25602 |
| 0-140 | 25606 |
| 0-150 | 25610 |
| 0-160 | 25613 |
| 0-170 | 25616 |
| 0-180 | 25617 |

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COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

EFFECTIVE FLOOR CAVITY REFLECTANCE 0.20

| RC | 80 | | | | 70 | | | | 50 | | | 30 | | | 10 | | | 0 |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| RW | 70 | 50 | 30 | 10 | 70 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 0 |
| 0 | 119 | 119 | 119 | 119 | 116 | 116 | 116 | 116 | 111 | 111 | 111 | 106 | 106 | 106 | 102 | 102 | 102 | 100 |
| 1 | 109 | 105 | 101 | 97 | 107 | 102 | 99 | 95 | 98 | 95 | 92 | 94 | 92 | 89 | 91 | 89 | 87 | 85 |
| 2 | 100 | 92 | 85 | 80 | 97 | 90 | 84 | 79 | 87 | 81 | 77 | 83 | 79 | 75 | 80 | 77 | 74 | 71 |
| 3 | 91 | 81 | 73 | 67 | 89 | 80 | 72 | 67 | 77 | 71 | 65 | 74 | 69 | 64 | 71 | 67 | 63 | 61 |
| 4 | 84 | 72 | 64 | 58 | 82 | 71 | 63 | 57 | 69 | 62 | 56 | 66 | 60 | 56 | 64 | 59 | 55 | 53 |
| 5 | 78 | 65 | 56 | 50 | 75 | 64 | 56 | 50 | 62 | 55 | 49 | 60 | 54 | 49 | 58 | 52 | 48 | 46 |
| 6 | 72 | 59 | 50 | 44 | 70 | 58 | 50 | 44 | 56 | 49 | 43 | 54 | 48 | 43 | 53 | 47 | 43 | 41 |
| 7 | 67 | 54 | 45 | 39 | 65 | 53 | 45 | 39 | 51 | 44 | 39 | 50 | 43 | 38 | 48 | 43 | 38 | 36 |
| 8 | 62 | 49 | 41 | 35 | 61 | 48 | 40 | 35 | 47 | 40 | 35 | 46 | 39 | 34 | 45 | 39 | 34 | 32 |
| 9 | 58 | 45 | 37 | 32 | 57 | 45 | 37 | 32 | 43 | 36 | 31 | 42 | 36 | 31 | 41 | 35 | 31 | 29 |
| 10 | 55 | 42 | 34 | 29 | 53 | 41 | 34 | 29 | 40 | 33 | 29 | 39 | 33 | 29 | 38 | 33 | 28 | 27 |

ALL CANDELA, LUMENS, LUMINANCE, AND VCP VALUES IN THIS REPORT ARE BASED ON ABSOLUTE PHOTOMETRY. THE COEFFICIENT OF UTILIZATION VALUES ARE BASED ON THE TOTAL ABSOLUTE LUMEN OUTPUT OF THIS LUMINAIRE SAMPLE.

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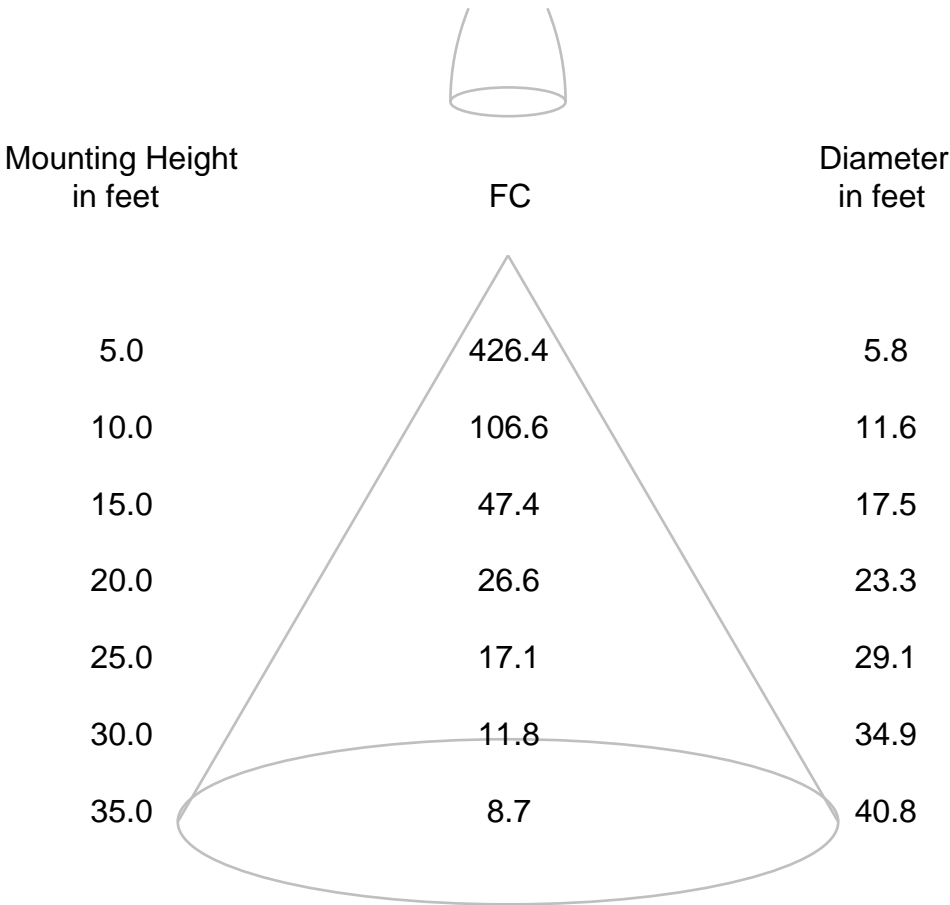
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CONE OF LIGHT DIAGRAM

(diameter shown is where fc value is half the fc at nadir)



Note: The candela values used to generate this diagram were obtained by averaging the photometric data into a single plane.

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DATE: 04/03/2017

PREPARED FOR: RAB LIGHTING INC.

CATALOG NUMBER: RAIL225NW/D10, RAILP225NW/D10 (Standard Distribution)

ADDRESS: 170 LUDLOW AVE, NORTHVALE, NJ 07647

LUMINAIRE: EXTRUDED METAL HOUSING WITH HEAT SINK FINS, TWO WHITE CIRCUIT BOARD WITH THREE HUNDRED LEDS ON EACH BOARD, METAL REFLECTOR WITH SPECULAR FINISH, FLAT TRANSLUCENT LENS WITH FROSTED SIDE IN.

LAMP: SIX HUNDRED LIGHT EMITTING DIODES (LEDS).

DRIVER: 2 x RDD-096-A2450

OBJECT OF TEST: DATA SHOWN IS ABSOLUTE FOR THE SAMPLE PROVIDED AT THE RATED INPUT VOLTAGES (120.0 AND 277.0 VAC, 60Hz) TO THE TEST SAMPLE.

| | | |
|--------------|---|----------------------|
| INSTRUMENTS: | GWINSTEK PROGRAMMABLE AC POWER SOURCE APS-7100 | Calibration Due: N/A |
| | CHROMA PROGRAMMABLE DIGITAL POWER METER MODEL 66202 | 3/01/18 |
| | OCEAN OPTICS QE65PRO Spectroradiometer | 03/07/18 |
| | RAB 2.0 meter Diameter Integrating Sphere, 4PI Geometry | 03/07/18 |

OBJECT OF TEST: Measure the Absolute Flux in lumens*, Total Radiant Flux*, Spectral Power Distribution (SPD), Correlated Color Temperature (CCT), Color Rendering Indices (CRIa,1-14), Chromaticity Coordinates (x,y; u'v'), ANSI C78.377 Duv, and electrical data including ANSI C82.77-2002 Power Factor (PF), and Total Harmonic Distortion (THD) to the test sample. Measure electrical data including Total Harmonic Distortion (THD) at maximum nominal rated input voltage. Report Off-State Power.

PROCEDURE: The test sample was mounted inside the integrating sphere, energized, and allowed to stabilize. After stabilization occurred, measurements were taken. In order to measure mean performance, multiple data sets were recorded and averaged. Readings were taken with the test sample operating at 60 HZ input in a 25 +/-1 degree Celsius free air ambient and in accordance with IESNA LM-79-08. Electrical data was also recorded at maximum nominal rated input voltage (277.0 VAC). All data are traceable to the National Institute of Standards and Technology. Off-State Power was reported with no voltage applied to the sample.

*NOTE: Proper calibration of integrating spheres for measuring total flux output of non-directional samples will produce reliable, repeatable results within the calibration tolerances of the equipment used. However, measurement of test samples with significant self absorption and/or directional output, even when these effects are compensated for, are likely to have a greater variation in results compared to the flux output calculated from a goniophotometric exploration since these artifacts do not affect the goniophotometric results.

RESULTS: (continued subsequent pages)

| | |
|----------|---|
| Checked | <u>X.CAO</u> |
| Approved | <u>D.WANG-MUNSON</u> Lighting Engineer |

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RESULTS:

| PHOTOMETRIC | |
|---------------------------------|-------------------|
| Total Integrated Flux (lumens) | 25617 * |
| SPECTRORADIOMETRIC | |
| Observer | CIE 1931 2 degree |
| Chromaticity Ordinate x | 0.3766 |
| Chromaticity Ordinate y | 0.3693 |
| Observer | CIE 1976 2 degree |
| Chromaticity Ordinate u' | 0.2256 |
| Chromaticity Ordinate v' | 0.4977 |
| Correlated Color Temp CCT (K) | 4052 |
| ANSI C78.377-2008 Duv | -0.002 |
| Total Radiant Flux (milliWatts) | 75919 * |
| ELECTRICAL | |
| Input Voltage (Volts AC) | 120.0 |
| Input Current (Amps AC) | 1.66 |
| Input Power (Watts) | 199.3 |
| Input Power Factor (%) | 99.9 |
| Input Current THD (%) | 2.4 |
| Input Voltage THD (%) | 0.2 |
| EFFICACY (Lumens/Watt) | |
| | 128.5 |
| ELECTRICAL AT MAX NONIMAL INPUT | |
| Input Voltage (Volts AC) | 277.0 |
| Input Current (Amps AC) | 0.731 |
| Input Power (Watts) | 193.4 |
| Input Power Factor (%) | 95.5 |
| Input Current THD (%) | 6.6 |
| Input Voltage THD (%) | 0.2 |
| Off-State Power (Watts) | 0.0 |

| COLOR RENDERING INDICES | CRI |
|---------------------------------|-----|
| Ra (Average 1-8) | 78 |
| R1 Light greyish red | 75 |
| R2 Dark greyish yellow | 87 |
| R3 Strong yellowish green | 93 |
| R4 Moderate yellowish green | 74 |
| R5 Light bluish green | 76 |
| R6 Light blue | 81 |
| R7 Light violet | 81 |
| R8 Light reddish purple | 55 |
| R9 Strong red | -16 |
| R10 Strong yellow | 68 |
| R11 Strong green | 71 |
| R12 Strong blue | 54 |
| R13 Light yellowish pink (skin) | 78 |
| R14 Moderate olive green (leaf) | 97 |

*NOTE:

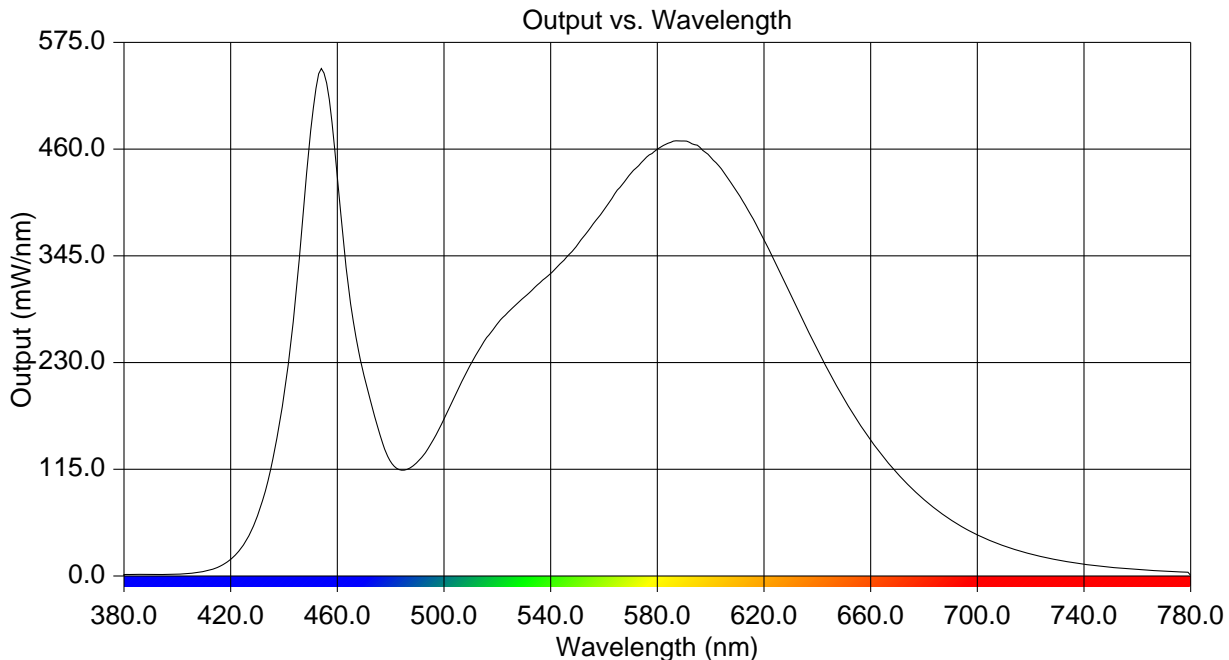
Proper calibration of integrating spheres for measuring total flux output of non-directional samples will produce reliable, repeatable results within the calibration tolerances of the equipment used. However, measurement of test samples with significant self absorption and/or directional output, even when these effects are compensated for, are likely to have a greater variation in results compared to the flux output calculated from a goniophotometric exploration since these artifacts do not affect the goniophotometric results.

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RESULTS:

| Wavelength | mW per nm | Wavelength | mW per nm | Wavelength | mW per nm |
|------------|-----------|------------|-----------|------------|-----------|
| 380 | 1.526 | 515 | 252.791 | 650 | 191.346 |
| 385 | 1.567 | 520 | 271.945 | 655 | 167.583 |
| 390 | 1.627 | 525 | 287.336 | 660 | 146.613 |
| 395 | 1.755 | 530 | 300.485 | 665 | 127.730 |
| 400 | 2.085 | 535 | 313.786 | 670 | 110.639 |
| 405 | 2.895 | 540 | 325.968 | 675 | 95.397 |
| 410 | 4.845 | 545 | 340.431 | 680 | 82.133 |
| 415 | 9.148 | 550 | 356.539 | 685 | 70.507 |
| 420 | 17.882 | 555 | 375.731 | 690 | 60.513 |
| 425 | 34.561 | 560 | 394.598 | 695 | 52.000 |
| 430 | 64.554 | 565 | 416.134 | 700 | 44.403 |
| 435 | 114.922 | 570 | 434.043 | 705 | 37.888 |
| 440 | 194.684 | 575 | 448.670 | 710 | 32.299 |
| 445 | 318.396 | 580 | 460.155 | 715 | 27.615 |
| 450 | 479.917 | 585 | 467.485 | 720 | 23.722 |
| 455 | 542.223 | 590 | 468.999 | 725 | 20.298 |
| 460 | 430.007 | 595 | 464.459 | 730 | 17.395 |
| 465 | 292.817 | 600 | 451.490 | 735 | 14.925 |
| 470 | 216.190 | 605 | 435.385 | 740 | 12.709 |
| 475 | 161.959 | 610 | 414.117 | 745 | 10.981 |
| 480 | 123.020 | 615 | 389.577 | 750 | 9.498 |
| 485 | 114.228 | 620 | 362.531 | 755 | 8.059 |
| 490 | 122.817 | 625 | 333.339 | 760 | 6.994 |
| 495 | 142.067 | 630 | 302.687 | 765 | 6.062 |
| 500 | 169.486 | 635 | 273.164 | 770 | 5.214 |
| 505 | 198.927 | 640 | 244.327 | 775 | 4.526 |
| 510 | 228.055 | 645 | 217.002 | 780 | 0.684 |



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CIE Chromaticity Diagram

