# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

## LEDVANCE LLC

200 Ballardvale Street Wilmington, MA 01887

## #Test Model: LEDMD4R2A800ST9SC3

| | |
|---|---|
| **Report Type:** | Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution |
| **Test Engineer:** | Hexy He |
| **Report Number:** | RSZ191009505-10 |
| **Test Date:** | 2019-09-02 to 2019-09-03 |
| **Report Date:** | 2019-10-10 |
| **Reviewed By:** | Bill Xiong / EE Engineer |
| **Prepared By:** | Bay Area Compliance Laboratories Corp. (Dongguan).<br>No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia ,<br>Dongguan, Guangdong, China.<br>Tel: +86-0769-86858888<br>Fax:+86-0769-86858588 |
| **Accreditation:** | The IAS Accreditation Number TL-460. |

FINAL

# 1. Product Description

**General Information:**

One test sample was in good condition and received on 2019-08-29 and used for testing. All tests and evaluations were performed at the least efficient white light setting.

| | |
|---|---|
| #Model Tested: | LEDMD4R2A800ST9SC3 |
| #Manufacturer: | LEDVANCE LLC |
| #Product Designation: | LED Recessed Downlight |
| Burning Time Before Test: | 0hour(For New Products) |

**#Rated Values:**

| | |
|---|---|
| Rated Voltage/Frequency: | 120 V AC 60Hz |
| Rated Power: | 13W |
| Nominal CCT: | 2700K, 3000K, 3500K, 4000K, 5000K |

**Note:**

1. The applicant LEDVANCE LLC declare that their products with model LEDMD4R2A800ST9SC3 are the same to the products in report#RSZ190829502-10-1 and is authorized by original applicant to use their test data.

2. All the data in previous report (RSZ190829502-10-1) is shared in this report.

# 2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-10-2014: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-18: IES Method for Evaluating Light Source Color Rendition (This method is not in IAS accreditation scope)

# 3. Description of Test Equipment

| Device | Manufacture | Model No | Serial No | Calibration date | Calibration due date |
|---|---|---|---|---|---|
| 1.5m temperature integrating sphere | SENSING | SPR-600 | S09008 | 2019-06-28 | 2020-06-27 |
| High-precision rapid spectral analysis system | EVERFINE | HAAS-2000 | M112048CA1361125 | 2018-12-13 | 2019-12-13 |
| Digital power meter | YOKOGAWA | WT310 | 13398 | 2019-07-12 | 2020-07-11 |
| Programmable Precision DC Power Supply | ITECH | IT6154 | 0061 0417 6471 0010 19 | 2019-03-08 | 2020-03-07 |
| thermometer | SENSING | NA | NA | 2019-03-08 | 2020-03-07 |
| Standard Light Source | EVERFINE | D204 | N/A | 2019-07-19 | 2020-07-18 |
| Precision frequency power supply | ALL Power | APW-105N | 970613 | 2019-03-08 | 2020-03-07 |
| AC POWER SUPPLY | EVERFINE | VPS1030 PWM | 1012017 | 2019-03-08 | 2020-03-07 |
| Digital CC&CV DC Power Supply | EVERFINE | WY12010 | 1009009 | 2019-04-10 | 2020-04-09 |

| Device | Manufacture | Model No | Serial No | Calibration date | Calibration due date |
|---|---|---|---|---|---|
| Digital power meter | YOKOGAWA | WT-210 | 91j926132 | 2019-03-08 | 2020-03-07 |
| full-field speed goniophotometer | EVERFINE | GO-R5000 | YG108492N10120001 | 2019-03-08 | 2020-03-07 |
| Wireless Remote Sensor | N/A | 433MHz | N/A | 2019-03-08 | 2020-03-07 |
| Standard Light Source | EVERFINE | D908 | 1012001 | 2018-12-24 | 2019-12-24 |

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

## 4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at 25°C±1°C during measurement. And relative humidity is less than 65%.

**Integrating Sphere System**

The system includes AC power source, digital power meter, DC power supply, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum light source before measurement.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is U=2.1% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=25K (K=2), at the 95% confidence level. The uncertainty of the CRI is U=2.1(K=2), at the 95% confidence level.

The uncertainty of power meter AC current U=0.19 % of rdg, AC Voltage U=0.17% of rdg, Power U=0.48%) (K=2), at the 95% confidence level.

**Goniophotometer System**

The goniophotometer system is calibrated by standard light source before measurement.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report. The vertical angle ($\gamma$) test intervals were set no more than 1 degree while data for 5 degree intervals is reported. The horizontal angle (C plane) test intervals were set no more than 22.5 degree.

The uncertainty of the luminous intensity is U=2.82% (K=2), at the 95% confidence level.

**Fidelity Index and Gamut Index Calculation**

The $R_f$, $R_g$ was calculated according to IES TM-30-18 by using calculation tools. The calculation was based on the measured SPD from 380nm to 780nm with 1nm intervals. All the colors in this report is for reference only.

# 5. Test Result

## [Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Downward**

### Photometric and Electrical Measurement Result

| Voltage (V) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | Luminous Flux(lm) | Efficacy (lm/W) |
|---|---|---|---|---|---|---|
| 120 | 60 | 0.1089 | 12.75 | 0.9755 | 807.9 | 63.37 |

| Radiant Flux (W) | CCT (K) | Duv | x | y | u' | v' |
|---|---|---|---|---|---|---|
| 2.8389 | 2677 | -0.00176 | 0.4587 | 0.4056 | 0.2640 | 0.5253 |

### Color Rendering Index

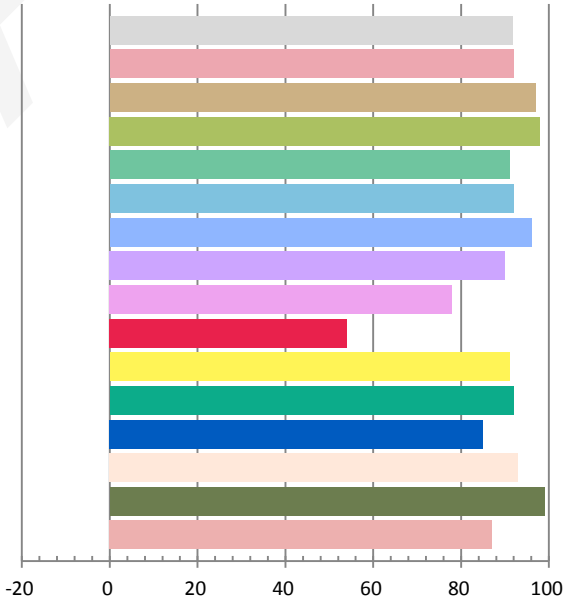
| Ra |
|---|
| 91.7 |

| R1 | R2 | R3 | R4 |
|---|---|---|---|
| 92 | 97 | 98 | 91 |

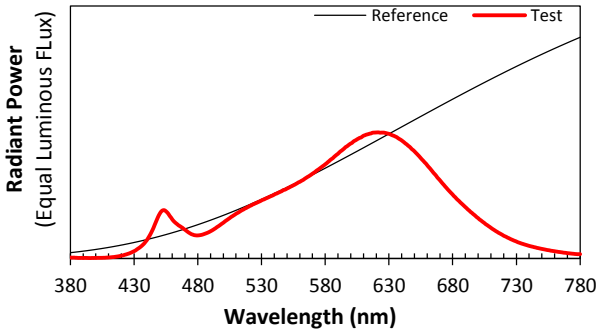
| R5 | R6 | R7 | R8 |
|---|---|---|---|
| 92 | 96 | 90 | 78 |

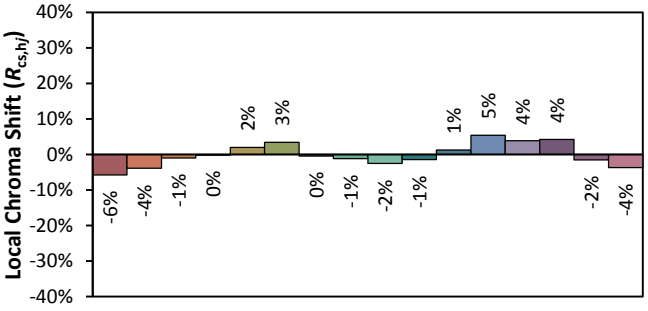
| R9 | R10 | R11 | R12 |
|---|---|---|---|
| 54 | 91 | 92 | 85 |

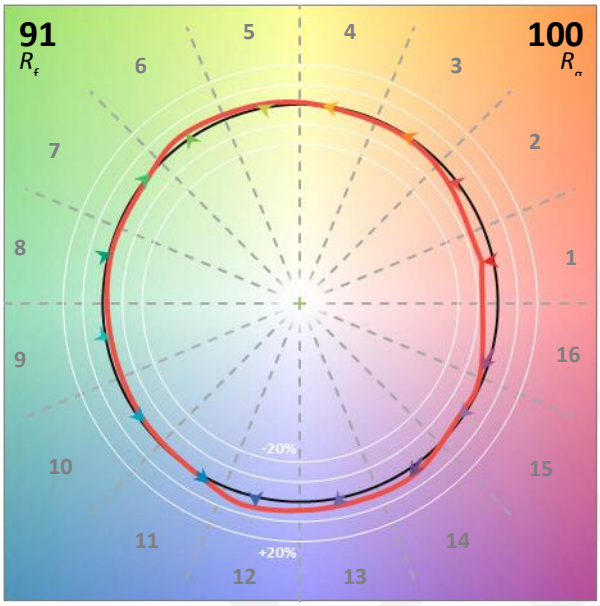
| R13 | R14 | R15 |
|---|---|---|
| 93 | 99 | 87 |

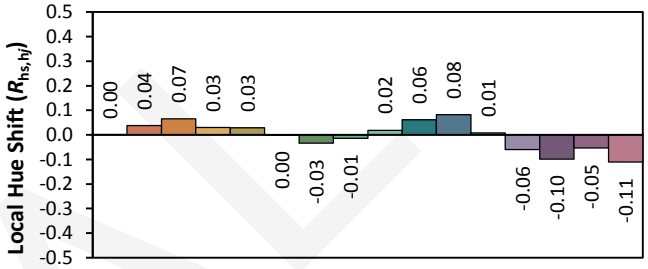


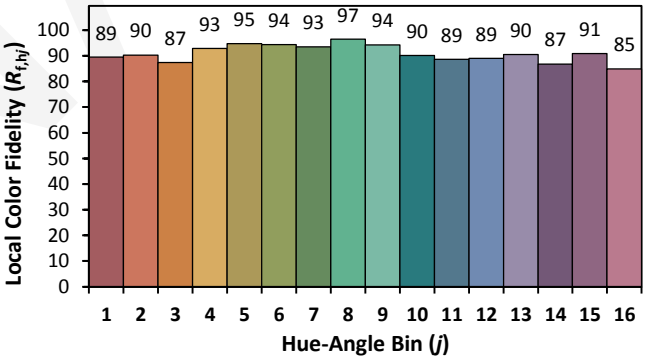

FINAL

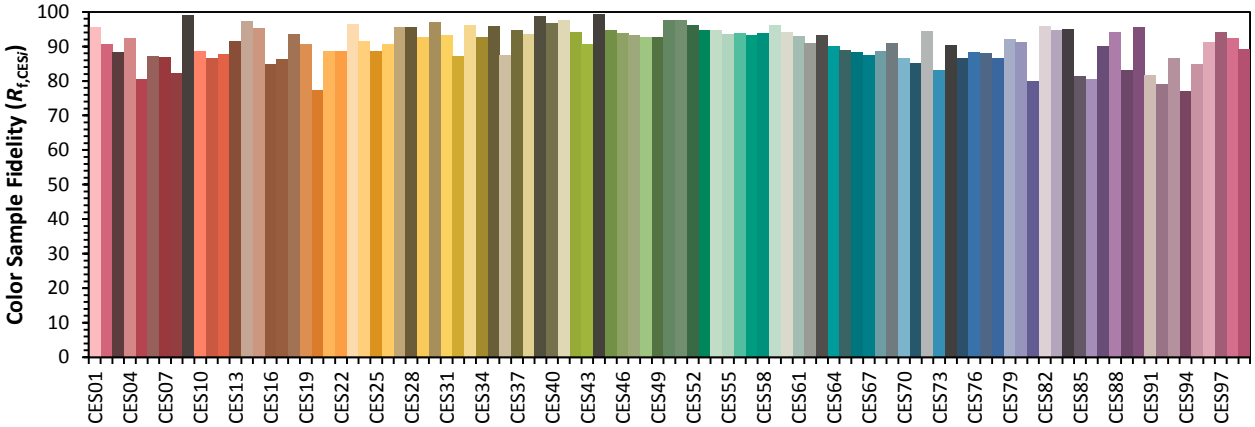

Reference
Test
Radiant Power
(Equal Luminous FLux)
380 430 480 530 580 630 680 730 780
Wavelength (nm)


Local Chroma Shift ($R_{cs,hj}$)
40% 30% 20% 10% 0% -10% -20% -30% -40%
-6% -4% -1% 0% 2% 3% 0% -1% -2% -1% 1% 5% 4% 4% -2% -4%

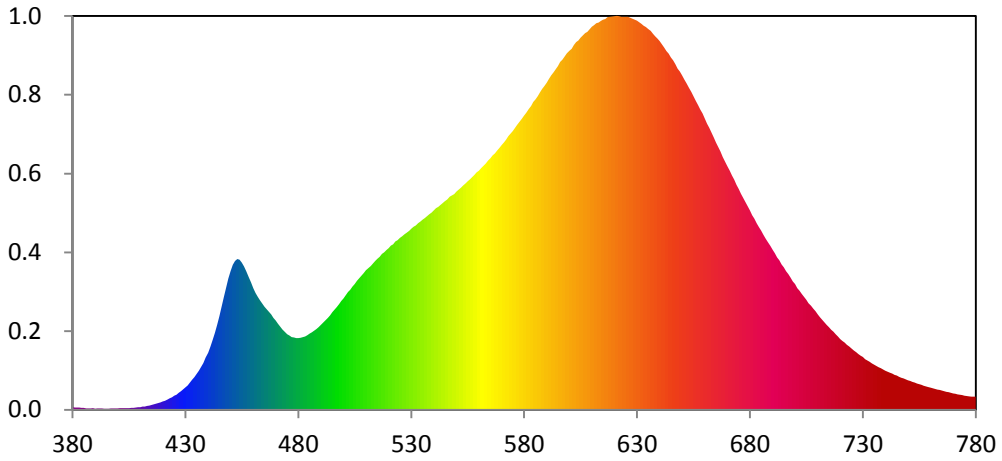

91
$R_f$
100
$R_g$
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
-20%
+20%


Local Hue Shift ($R_{hs,hj}$)
0.5 0.4 0.3 0.2 0.1 0.0 -0.1 -0.2 -0.3 -0.4 -0.5
0.00 0.04 0.07 0.03 0.03 0.00 -0.03 -0.01 0.02 0.06 0.08 0.01 -0.06 -0.10 -0.05 -0.11


Local Color Fidelity ($R_{f,hj}$)
100 90 80 70 60 50 40 30 20 10 0
89 90 87 93 95 94 93 97 94 90 89 89 90 87 91 85
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Hue-Angle Bin ($j$)


Color Sample Fidelity ($R_{f,CESi}$)
100 90 80 70 60 50 40 30 20 10 0
CES01 CES04 CES07 CES10 CES13 CES16 CES19 CES22 CES25 CES28 CES31 CES34 CES37 CES40 CES43 CES46 CES49 CES52 CES55 CES58 CES61 CES64 CES67 CES70 CES73 CES76 CES79 CES82 CES85 CES88 CES91 CES94 CES97

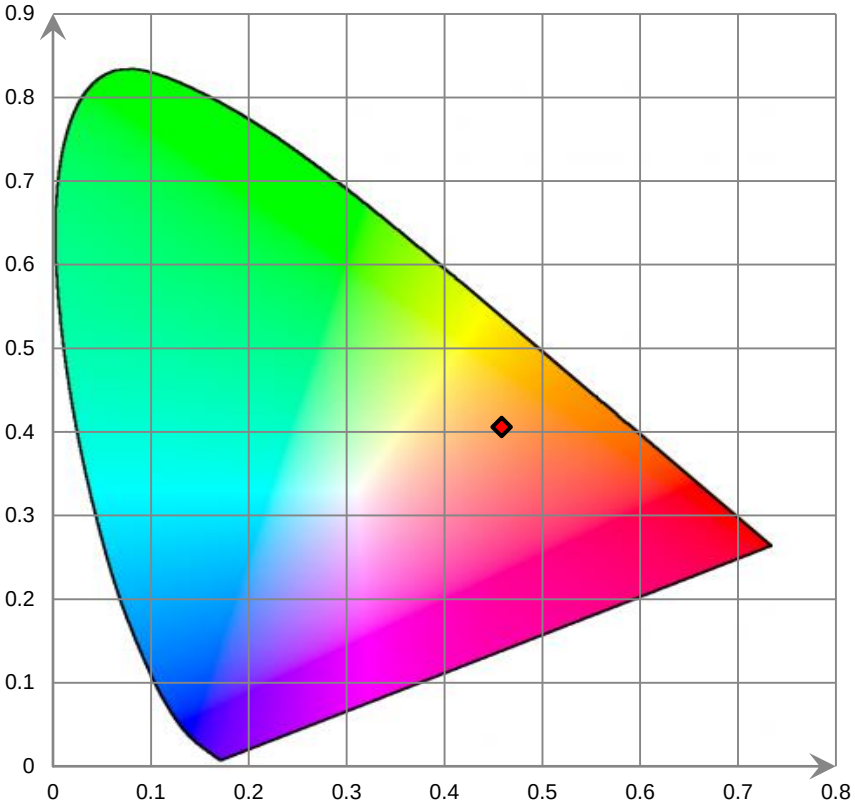
## Relative Spectral Power Distribution



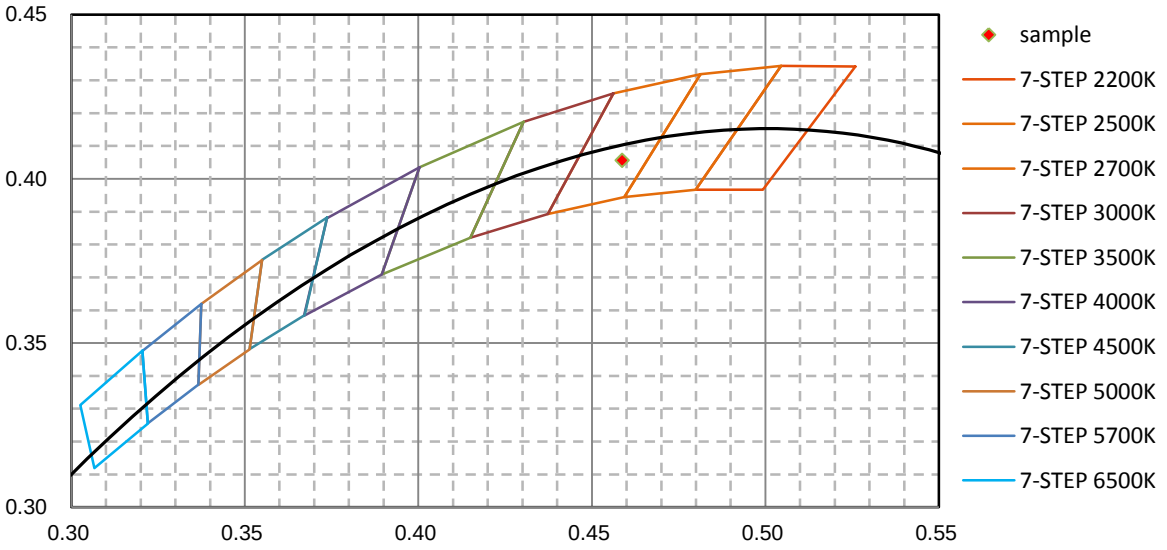

| nm | mW | nm | mW | nm | mW | nm | mW | nm | mW |
|---|---|---|---|---|---|---|---|---|---|
| 380 | 1.283E-01 | 421 | 4.057E-01 | 462 | 5.071E+00 | 503 | 5.400E+00 | 544 | 9.293E+00 |
| 381 | 9.491E-02 | 422 | 4.562E-01 | 463 | 4.917E+00 | 504 | 5.532E+00 | 545 | 9.378E+00 |
| 382 | 1.012E-01 | 423 | 5.157E-01 | 464 | 4.776E+00 | 505 | 5.654E+00 | 546 | 9.454E+00 |
| 383 | 1.039E-01 | 424 | 5.617E-01 | 465 | 4.625E+00 | 506 | 5.798E+00 | 547 | 9.586E+00 |
| 384 | 8.054E-02 | 425 | 6.244E-01 | 466 | 4.519E+00 | 507 | 5.907E+00 | 548 | 9.632E+00 |
| 385 | 7.850E-02 | 426 | 6.824E-01 | 467 | 4.397E+00 | 508 | 6.022E+00 | 549 | 9.703E+00 |
| 386 | 5.800E-02 | 427 | 7.553E-01 | 468 | 4.285E+00 | 509 | 6.140E+00 | 550 | 9.811E+00 |
| 387 | 6.077E-02 | 428 | 8.351E-01 | 469 | 4.129E+00 | 510 | 6.265E+00 | 551 | 9.896E+00 |
| 388 | 5.792E-02 | 429 | 9.215E-01 | 470 | 4.013E+00 | 511 | 6.367E+00 | 552 | 9.987E+00 |
| 389 | 6.343E-02 | 430 | 1.008E+00 | 471 | 3.877E+00 | 512 | 6.458E+00 | 553 | 1.009E+01 |
| 390 | 4.400E-02 | 431 | 1.097E+00 | 472 | 3.737E+00 | 513 | 6.580E+00 | 554 | 1.017E+01 |
| 391 | 6.000E-02 | 432 | 1.228E+00 | 473 | 3.610E+00 | 514 | 6.694E+00 | 555 | 1.027E+01 |
| 392 | 5.865E-02 | 433 | 1.355E+00 | 474 | 3.505E+00 | 515 | 6.795E+00 | 556 | 1.035E+01 |
| 393 | 5.718E-02 | 434 | 1.472E+00 | 475 | 3.400E+00 | 516 | 6.883E+00 | 557 | 1.046E+01 |
| 394 | 4.733E-02 | 435 | 1.608E+00 | 476 | 3.342E+00 | 517 | 7.000E+00 | 558 | 1.056E+01 |
| 395 | 4.484E-02 | 436 | 1.757E+00 | 477 | 3.271E+00 | 518 | 7.074E+00 | 559 | 1.068E+01 |
| 396 | 3.845E-02 | 437 | 1.922E+00 | 478 | 3.243E+00 | 519 | 7.185E+00 | 560 | 1.075E+01 |
| 397 | 5.545E-02 | 438 | 2.103E+00 | 479 | 3.220E+00 | 520 | 7.266E+00 | 561 | 1.086E+01 |
| 398 | 4.928E-02 | 439 | 2.337E+00 | 480 | 3.224E+00 | 521 | 7.382E+00 | 562 | 1.096E+01 |
| 399 | 5.851E-02 | 440 | 2.555E+00 | 481 | 3.238E+00 | 522 | 7.442E+00 | 563 | 1.106E+01 |
| 400 | 5.097E-02 | 441 | 2.829E+00 | 482 | 3.268E+00 | 523 | 7.562E+00 | 564 | 1.120E+01 |
| 401 | 6.467E-02 | 442 | 3.134E+00 | 483 | 3.301E+00 | 524 | 7.627E+00 | 565 | 1.131E+01 |
| 402 | 7.249E-02 | 443 | 3.453E+00 | 484 | 3.355E+00 | 525 | 7.721E+00 | 566 | 1.143E+01 |
| 403 | 6.637E-02 | 444 | 3.817E+00 | 485 | 3.417E+00 | 526 | 7.791E+00 | 567 | 1.153E+01 |
| 404 | 7.108E-02 | 445 | 4.194E+00 | 486 | 3.487E+00 | 527 | 7.880E+00 | 568 | 1.165E+01 |
| 405 | 7.058E-02 | 446 | 4.628E+00 | 487 | 3.552E+00 | 528 | 7.959E+00 | 569 | 1.177E+01 |
| 406 | 8.301E-02 | 447 | 5.060E+00 | 488 | 3.628E+00 | 529 | 8.039E+00 | 570 | 1.190E+01 |
| 407 | 8.104E-02 | 448 | 5.486E+00 | 489 | 3.711E+00 | 530 | 8.140E+00 | 571 | 1.202E+01 |
| 408 | 9.992E-02 | 449 | 5.897E+00 | 490 | 3.809E+00 | 531 | 8.232E+00 | 572 | 1.214E+01 |
| 409 | 1.073E-01 | 450 | 6.233E+00 | 491 | 3.907E+00 | 532 | 8.285E+00 | 573 | 1.230E+01 |
| 410 | 1.195E-01 | 451 | 6.513E+00 | 492 | 4.015E+00 | 533 | 8.383E+00 | 574 | 1.242E+01 |
| 411 | 1.363E-01 | 452 | 6.693E+00 | 493 | 4.132E+00 | 534 | 8.459E+00 | 575 | 1.254E+01 |
| 412 | 1.495E-01 | 453 | 6.769E+00 | 494 | 4.244E+00 | 535 | 8.540E+00 | 576 | 1.268E+01 |
| 413 | 1.723E-01 | 454 | 6.745E+00 | 495 | 4.384E+00 | 536 | 8.623E+00 | 577 | 1.281E+01 |
| 414 | 1.841E-01 | 455 | 6.614E+00 | 496 | 4.497E+00 | 537 | 8.708E+00 | 578 | 1.295E+01 |
| 415 | 2.118E-01 | 456 | 6.449E+00 | 497 | 4.620E+00 | 538 | 8.783E+00 | 579 | 1.307E+01 |
| 416 | 2.395E-01 | 457 | 6.231E+00 | 498 | 4.751E+00 | 539 | 8.859E+00 | 580 | 1.322E+01 |
| 417 | 2.650E-01 | 458 | 5.952E+00 | 499 | 4.883E+00 | 540 | 8.961E+00 | 581 | 1.335E+01 |
| 418 | 2.971E-01 | 459 | 5.728E+00 | 500 | 5.002E+00 | 541 | 9.057E+00 | 582 | 1.352E+01 |
| 419 | 3.332E-01 | 460 | 5.465E+00 | 501 | 5.148E+00 | 542 | 9.115E+00 | 583 | 1.366E+01 |
| 420 | 3.705E-01 | 461 | 5.249E+00 | 502 | 5.288E+00 | 543 | 9.213E+00 | 584 | 1.383E+01 |

| nm | mW | nm | mW | nm | mW | nm | mW | nm | mW |
|---|---|---|---|---|---|---|---|---|---|
| 585 | 1.396E+01 | 626 | 1.767E+01 | 667 | 1.161E+01 | 708 | 4.546E+00 | 749 | 1.363E+00 |
| 586 | 1.409E+01 | 627 | 1.763E+01 | 668 | 1.136E+01 | 709 | 4.426E+00 | 750 | 1.328E+00 |
| 587 | 1.427E+01 | 628 | 1.759E+01 | 669 | 1.117E+01 | 710 | 4.293E+00 | 751 | 1.292E+00 |
| 588 | 1.442E+01 | 629 | 1.754E+01 | 670 | 1.097E+01 | 711 | 4.163E+00 | 752 | 1.255E+00 |
| 589 | 1.457E+01 | 630 | 1.750E+01 | 671 | 1.075E+01 | 712 | 4.047E+00 | 753 | 1.218E+00 |
| 590 | 1.470E+01 | 631 | 1.743E+01 | 672 | 1.053E+01 | 713 | 3.933E+00 | 754 | 1.178E+00 |
| 591 | 1.488E+01 | 632 | 1.735E+01 | 673 | 1.034E+01 | 714 | 3.813E+00 | 755 | 1.150E+00 |
| 592 | 1.504E+01 | 633 | 1.727E+01 | 674 | 1.012E+01 | 715 | 3.712E+00 | 756 | 1.123E+00 |
| 593 | 1.516E+01 | 634 | 1.721E+01 | 675 | 9.924E+00 | 716 | 3.592E+00 | 757 | 1.075E+00 |
| 594 | 1.531E+01 | 635 | 1.712E+01 | 676 | 9.713E+00 | 717 | 3.502E+00 | 758 | 1.053E+00 |
| 595 | 1.546E+01 | 636 | 1.704E+01 | 677 | 9.520E+00 | 718 | 3.398E+00 | 759 | 1.025E+00 |
| 596 | 1.564E+01 | 637 | 1.691E+01 | 678 | 9.333E+00 | 719 | 3.298E+00 | 760 | 9.969E-01 |
| 597 | 1.574E+01 | 638 | 1.679E+01 | 679 | 9.145E+00 | 720 | 3.182E+00 | 761 | 9.655E-01 |
| 598 | 1.588E+01 | 639 | 1.669E+01 | 680 | 8.962E+00 | 721 | 3.099E+00 | 762 | 9.391E-01 |
| 599 | 1.602E+01 | 640 | 1.657E+01 | 681 | 8.747E+00 | 722 | 3.020E+00 | 763 | 9.042E-01 |
| 600 | 1.614E+01 | 641 | 1.643E+01 | 682 | 8.590E+00 | 723 | 2.917E+00 | 764 | 8.898E-01 |
| 601 | 1.623E+01 | 642 | 1.629E+01 | 683 | 8.386E+00 | 724 | 2.840E+00 | 765 | 8.599E-01 |
| 602 | 1.640E+01 | 643 | 1.613E+01 | 684 | 8.210E+00 | 725 | 2.746E+00 | 766 | 8.344E-01 |
| 603 | 1.652E+01 | 644 | 1.601E+01 | 685 | 8.055E+00 | 726 | 2.662E+00 | 767 | 7.979E-01 |
| 604 | 1.661E+01 | 645 | 1.584E+01 | 686 | 7.861E+00 | 727 | 2.586E+00 | 768 | 7.821E-01 |
| 605 | 1.673E+01 | 646 | 1.571E+01 | 687 | 7.701E+00 | 728 | 2.503E+00 | 769 | 7.643E-01 |
| 606 | 1.683E+01 | 647 | 1.554E+01 | 688 | 7.537E+00 | 729 | 2.435E+00 | 770 | 7.317E-01 |
| 607 | 1.693E+01 | 648 | 1.534E+01 | 689 | 7.363E+00 | 730 | 2.365E+00 | 771 | 7.152E-01 |
| 608 | 1.698E+01 | 649 | 1.521E+01 | 690 | 7.197E+00 | 731 | 2.275E+00 | 772 | 6.935E-01 |
| 609 | 1.710E+01 | 650 | 1.504E+01 | 691 | 7.035E+00 | 732 | 2.213E+00 | 773 | 6.723E-01 |
| 610 | 1.723E+01 | 651 | 1.485E+01 | 692 | 6.854E+00 | 733 | 2.149E+00 | 774 | 6.538E-01 |
| 611 | 1.729E+01 | 652 | 1.467E+01 | 693 | 6.716E+00 | 734 | 2.082E+00 | 775 | 6.382E-01 |
| 612 | 1.737E+01 | 653 | 1.448E+01 | 694 | 6.533E+00 | 735 | 2.030E+00 | 776 | 6.127E-01 |
| 613 | 1.742E+01 | 654 | 1.429E+01 | 695 | 6.401E+00 | 736 | 1.971E+00 | 777 | 6.014E-01 |
| 614 | 1.747E+01 | 655 | 1.408E+01 | 696 | 6.235E+00 | 737 | 1.915E+00 | 778 | 5.856E-01 |
| 615 | 1.753E+01 | 656 | 1.388E+01 | 697 | 6.100E+00 | 738 | 1.862E+00 | 779 | 5.902E-01 |
| 616 | 1.756E+01 | 657 | 1.370E+01 | 698 | 5.942E+00 | 739 | 1.807E+00 | 780 | 5.913E-01 |
| 617 | 1.765E+01 | 658 | 1.349E+01 | 699 | 5.771E+00 | 740 | 1.753E+00 | | |
| 618 | 1.767E+01 | 659 | 1.332E+01 | 700 | 5.647E+00 | 741 | 1.706E+00 | | |
| 619 | 1.768E+01 | 660 | 1.309E+01 | 701 | 5.472E+00 | 742 | 1.662E+00 | | |
| 620 | 1.769E+01 | 661 | 1.287E+01 | 702 | 5.357E+00 | 743 | 1.622E+00 | | |
| 621 | 1.770E+01 | 662 | 1.268E+01 | 703 | 5.209E+00 | 744 | 1.568E+00 | | |
| 622 | 1.770E+01 | 663 | 1.246E+01 | 704 | 5.075E+00 | 745 | 1.535E+00 | | |
| 623 | 1.766E+01 | 664 | 1.224E+01 | 705 | 4.943E+00 | 746 | 1.478E+00 | | |
| 624 | 1.767E+01 | 665 | 1.201E+01 | 706 | 4.789E+00 | 747 | 1.443E+00 | | |
| 625 | 1.767E+01 | 666 | 1.182E+01 | 707 | 4.680E+00 | 748 | 1.403E+00 | | |

CIE 1931 x y Chromaticity Diagram




7-Step Chromaticity Quadrangles



## [Goniophotometer System]

Total operating time for luminous intensity distribution: **1.5 hours**

Test orientation: **Downward**

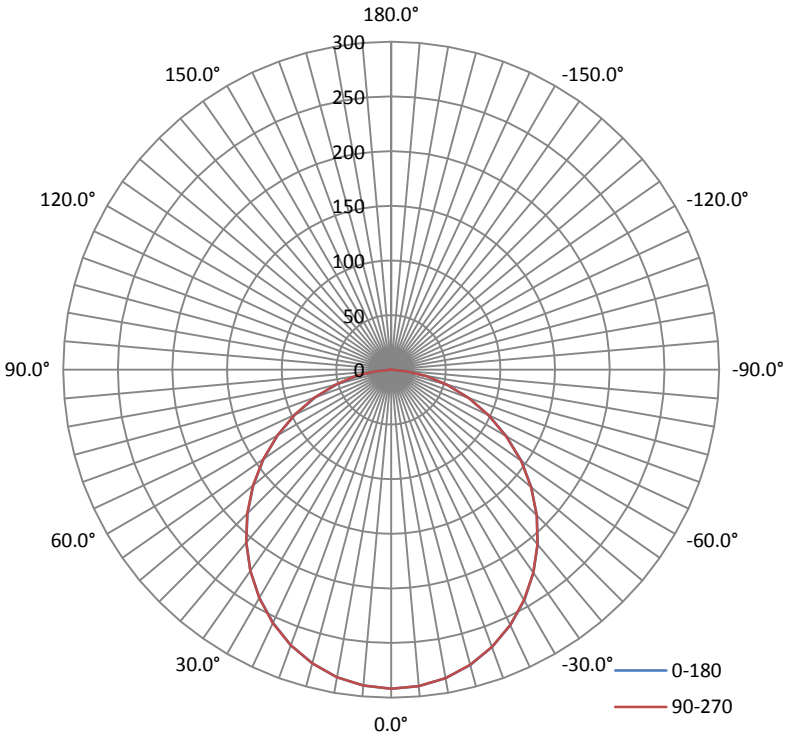
### Electrical Measurement

| Input Voltage (V) | Frequency (Hz) | Input Current (A) | Power (W) | Power Factor |
|---|---|---|---|---|
| 120.1 | 60 | 0.1094 | 12.73 | 0.9686 |

### Photometric Measurement

| Luminous Flux (lm) | Efficacy (lm/W) | $I_{max}$ (cd) | S/MH (C0/180) | S/MH (C90/270) |
|---|---|---|---|---|
| 808.094 | 63.48 | 292.3 | 1.24 | 1.24 |

### Luminous Intensity Distribution




| | C0/180 | C45/225 | C90/270 | C135/315 | AVG. |
|---|---|---|---|---|---|
| Beam Angle (50% $I_{max}$): | 109.1 | 109.1 | 109.1 | 109.1 | 109.1 |
| Field Angle (10% $I_{max}$): | 161.3 | 161.4 | 161.6 | 161.1 | 161.4 |

Luminous Intensity (cd) Distribution Data

| C / γ | 0° | 22.5° | 45° | 67.5° | 90° | 112.5° | 135° | 157.5° |
|---|---|---|---|---|---|---|---|---|
| 0.0° | 292 | 292 | 292 | 292 | 292 | 292 | 292 | 292 |
| 5.0° | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 |
| 10.0° | 285 | 285 | 285 | 285 | 285 | 286 | 286 | 286 |
| 15.0° | 278 | 278 | 278 | 278 | 278 | 278 | 279 | 279 |
| 20.0° | 268 | 268 | 268 | 268 | 268 | 269 | 269 | 270 |
| 25.0° | 255 | 255 | 256 | 255 | 256 | 256 | 257 | 258 |
| 30.0° | 241 | 241 | 241 | 241 | 241 | 242 | 243 | 243 |
| 35.0° | 224 | 224 | 224 | 224 | 224 | 225 | 226 | 227 |
| 40.0° | 206 | 205 | 205 | 205 | 206 | 207 | 208 | 208 |
| 45.0° | 186 | 185 | 185 | 185 | 186 | 187 | 188 | 188 |
| 50.0° | 165 | 164 | 164 | 164 | 165 | 166 | 166 | 167 |
| 55.0° | 142 | 142 | 142 | 142 | 143 | 143 | 144 | 145 |
| 60.0° | 120 | 119 | 119 | 120 | 120 | 121 | 121 | 122 |
| 65.0° | 97 | 96 | 97 | 97 | 97 | 98 | 98 | 99 |
| 70.0° | 74 | 74 | 74 | 74 | 75 | 75 | 75 | 76 |
| 75.0° | 51 | 51 | 52 | 52 | 53 | 53 | 53 | 53 |
| 80.0° | 31 | 31 | 32 | 32 | 32 | 32 | 32 | 32 |
| 85.0° | 13 | 13 | 14 | 14 | 14 | 14 | 14 | 14 |
| 90.0° | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 95.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 105.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 115.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 125.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 135.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 145.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 150.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 155.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 165.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 175.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 180.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

FINAL

Luminous Intensity (cd) Distribution Data (cont.)

| C / γ | 180° | 202.5° | 225° | 247.5° | 270° | 292.5° | 315° | 337.5° |
|---|---|---|---|---|---|---|---|---|
| 0.0° | 292 | 292 | 292 | 292 | 292 | 292 | 292 | 292 |
| 5.0° | 290 | 291 | 291 | 291 | 290 | 290 | 290 | 290 |
| 10.0° | 286 | 287 | 287 | 287 | 286 | 286 | 286 | 285 |
| 15.0° | 279 | 280 | 280 | 280 | 279 | 279 | 279 | 278 |
| 20.0° | 270 | 270 | 270 | 270 | 270 | 269 | 269 | 269 |
| 25.0° | 258 | 258 | 259 | 258 | 258 | 257 | 257 | 256 |
| 30.0° | 243 | 244 | 244 | 244 | 243 | 243 | 242 | 242 |
| 35.0° | 227 | 227 | 228 | 227 | 227 | 226 | 226 | 225 |
| 40.0° | 209 | 209 | 209 | 209 | 208 | 208 | 207 | 207 |
| 45.0° | 189 | 189 | 190 | 189 | 188 | 188 | 187 | 186 |
| 50.0° | 167 | 168 | 168 | 168 | 167 | 167 | 166 | 166 |
| 55.0° | 145 | 146 | 146 | 146 | 145 | 145 | 144 | 143 |
| 60.0° | 122 | 122 | 122 | 122 | 121 | 121 | 120 | 120 |
| 65.0° | 99 | 99 | 99 | 99 | 98 | 98 | 97 | 97 |
| 70.0° | 76 | 76 | 76 | 76 | 76 | 75 | 74 | 74 |
| 75.0° | 54 | 54 | 54 | 54 | 54 | 53 | 52 | 52 |
| 80.0° | 33 | 33 | 33 | 33 | 33 | 32 | 32 | 31 |
| 85.0° | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 13 |
| 90.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 95.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 105.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 115.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 125.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 135.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 145.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 150.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 155.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 165.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 175.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 180.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

FINAL

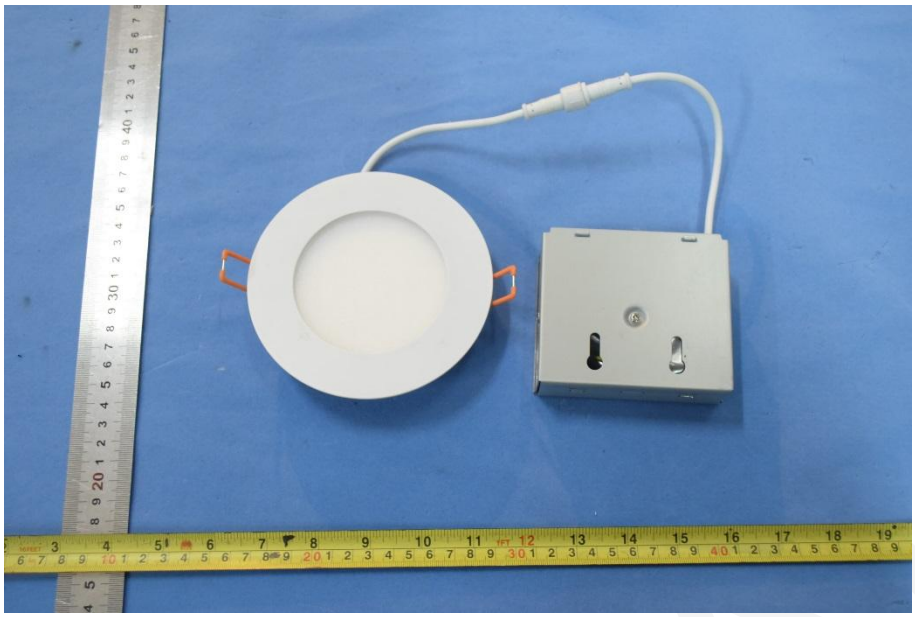
Zonal Lumen Density Measurement

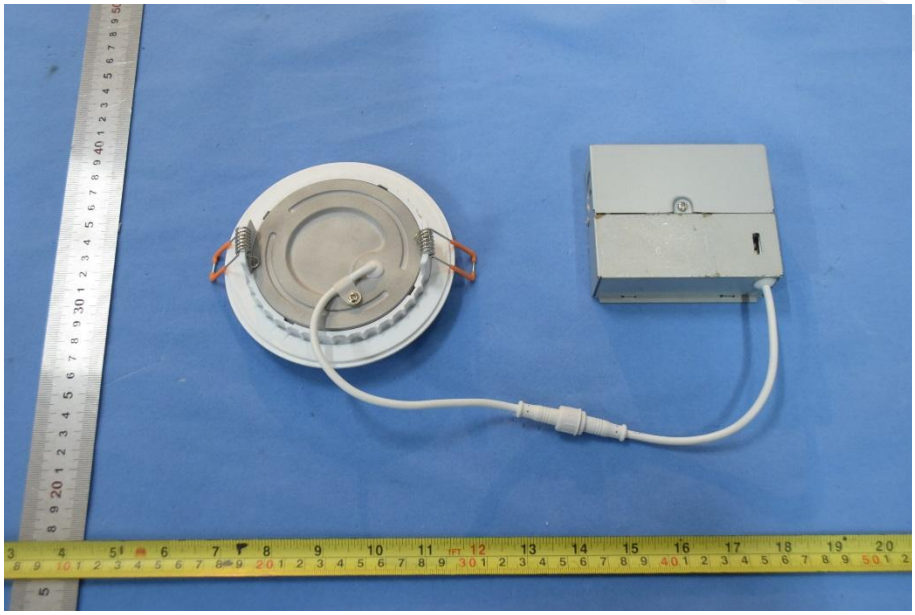
| Deg | Flux (lm) | % |
|---|---|---|
| 0-5 | 7.0 | 0.86 |
| 5-10 | 20.6 | 2.55 |
| 10-15 | 33.5 | 4.15 |
| 15-20 | 45.2 | 5.59 |
| 20-25 | 55.2 | 6.83 |
| 25-30 | 63.2 | 7.82 |
| 30-35 | 68.9 | 8.53 |
| 35-40 | 72.2 | 8.94 |
| 40-45 | 73.1 | 9.04 |
| 45-50 | 71.4 | 8.83 |
| 50-55 | 67.4 | 8.35 |
| 55-60 | 61.1 | 7.56 |
| 60-65 | 53.1 | 6.57 |
| 65-70 | 43.7 | 5.41 |
| 70-75 | 33.3 | 4.12 |
| 75-80 | 22.6 | 2.81 |
| 80-85 | 12.4 | 1.53 |
| 85-90 | 3.3 | 0.41 |
| 90-95 | 0.0 | 0.00 |
| 95-100 | 0.0 | 0.01 |
| 100-105 | 0.0 | 0.00 |
| 105-110 | 0.0 | 0.00 |
| 110-115 | 0.0 | 0.01 |
| 115-120 | 0.0 | 0.00 |
| 120-125 | 0.0 | 0.01 |
| 125-130 | 0.1 | 0.01 |
| 130-135 | 0.1 | 0.00 |
| 135-140 | 0.1 | 0.01 |
| 140-145 | 0.1 | 0.01 |
| 145-150 | 0.1 | 0.01 |
| 150-155 | 0.1 | 0.01 |
| 155-160 | 0.1 | 0.00 |
| 160-165 | 0.1 | 0.01 |
| 165-170 | 0.0 | 0.01 |
| 170-175 | 0.0 | 0.00 |
| 175-180 | 0.0 | 0.00 |

| Deg | Flux (lm) | % |
|---|---|---|
| 0-5 | 7.0 | 0.86 |
| 0-10 | 27.6 | 3.41 |
| 0-15 | 61.1 | 7.56 |
| 0-20 | 106.3 | 13.15 |
| 0-25 | 161.4 | 19.98 |
| 0-30 | 224.6 | 27.80 |
| 0-35 | 293.6 | 36.33 |
| 0-40 | 365.8 | 45.27 |
| 0-45 | 438.9 | 54.31 |
| 0-50 | 510.3 | 63.14 |
| 0-55 | 577.7 | 71.49 |
| 0-60 | 638.8 | 79.05 |
| 0-65 | 691.9 | 85.62 |
| 0-70 | 735.6 | 91.03 |
| 0-75 | 768.9 | 95.15 |
| 0-80 | 791.6 | 97.96 |
| 0-85 | 803.9 | 99.49 |
| 0-90 | 807.3 | 99.90 |
| 0-95 | 807.3 | 99.90 |
| 0-100 | 807.3 | 99.91 |
| 0-105 | 807.4 | 99.91 |
| 0-110 | 807.4 | 99.91 |
| 0-115 | 807.4 | 99.92 |
| 0-120 | 807.5 | 99.92 |
| 0-125 | 807.5 | 99.93 |
| 0-130 | 807.6 | 99.94 |
| 0-135 | 807.6 | 99.94 |
| 0-140 | 807.7 | 99.95 |
| 0-145 | 807.8 | 99.96 |
| 0-150 | 807.8 | 99.97 |
| 0-155 | 807.9 | 99.98 |
| 0-160 | 808.0 | 99.98 |
| 0-165 | 808.0 | 99.99 |
| 0-170 | 808.1 | 100.00 |
| 0-175 | 808.1 | 100.00 |
| 0-180 | 808.1 | 100.00 |

FINAL

## 6. Product Photo





## Directions

1. The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
5. This report cannot be reproduced except in full, without prior written approval of the Company.
6. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

**********END OF REPORT**********

FINAL