# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

## GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai, China

**Model: 27HID/840/277V/EX39/R，27HID/840/277V/E26**

| | |
|---|---|
| **Report Type:** | Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution |
| **Test Engineer:** | Daniel Duan |
| **Report Number:** | RKS160826009-10 |
| **Test Date:** | 2016-08-26 |
| **Report Date:** | 2016-08-31 |
| **Reviewed By:** | Jeanne Han/EE Manager |
| **Prepared By:** | Bay Area Compliance Laboratories Corp. (Dongguan).<br>Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.<br>Tel: +86-0769-86858888<br>Fax:+86-0769-86858588 |
| **Test Facility:** | Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China. |
| **Accreditation:** | The IAS Accreditation Number TL-460. |

## 1. Product Description

**General Information:**

One sample was received on 2016-08-26 and used for testing. Sample No.: RKS160826009-S01 Model: 27HID/840/277V/EX39/R

| | |
|---|---|
| Model Tested: | 27HID/840/277V/EX39/R |
| Manufacturer: | GREEN CREATIVE LTD |
| Brand Name: | GREEN CREATIVE |
| Product Designation: | LED HID |
| Burning Time Before Test: | 0hour(For New Products) |

**Rated Values:**

| | |
|---|---|
| Rated Voltage/Frequency: | 120 -277VAC 60Hz |
| Rated Power: | 27W |
| Nominal CCT: | 4000K |
| Nominal Lumen Output: | 3150 lm |
| Nominal CRI: | 80 |

### Family Declaration:

*GREEN CREATIVE LTD,* hereby declare that there are some differences between our Multiple Models and testing products. Details as below:

| Testing Model Number | Multiple listed Model Number | Difference | Details |
|---|---|---|---|
| 27HID/840/277V/EX39/R | 27HID/840/277V/EX39/R<br>27HID/840/277V/E26 | Lamp base | The lamp base of 27HID/840/277V/EX39/R is EX39;<br>The lamp base of 27HID/840/277V/E26 is E26 |

## 2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-15: 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 | Test Range | Calibration date | Calibration due date |
|---|---|---|---|---|---|---|
| 2.0m integrating sphere | EVERFINE | R98 | 11010018 | R98 | 2015-11-09 | 2016-11-08 |
| High accuracy array spectroradiometer | EVERFINE | HAAS-2000 | 1012016T | 380-780nm | 2016-03-10 | 2017-03-09 |
| Digital Power Meter | EVERFINE | PF2010A | 1011004 | 600V/20A | 2016-07-11 | 2017-07-10 |
| Digital CC&CV DC Power Supply | EVERFINE | WY305-V1 | 1101047 | 30V/5A | 2016-07-07 | 2017-07-06 |
| Temperature/humidity/clock | Victor | VC230 | EE023 | 0~40°C0~90% | 2016-03-21 | 2017-03-20 |
| Standard Light Source | SENSING | N/A | LSD090808 | N/A | 2015-09-25 | 2016-09-24 |

| Device | Manufacture | Model No | Serial No | Test Range | Calibration date | Calibration due date |
|---|---|---|---|---|---|---|
| Special zero-voltage synchronous switching AC | EVERFINE | DPS1010-YF | 1011001T | 30V/5A | 2016-03-04 | 2017-03-03 |
| AC Power Supply | EVERFINE | VPS1030 PWM | 1012017 | 0-150V， 0-300V | 2016-03-04 | 2017-03-03 |
| DC Power Supply | EVERFINE | WY12010 | 1009009 | 30V/5A | 2016-03-04 | 2017-03-03 |
| Power Meter | YOKOGAWA | WT-210 | 91KB35700 | 15/30/60/150/300/600V | 2016-03-04 | 2017-03-03 |
| Goniophotometer | EVERFINE | GO-R5000 | YG108492N10120001 | 1600mm,3000W/10A | 2016-03-10 | 2017-03-09 |
| Wireless Remote Sensor | N/A | 433MHz | N/A | 0°C~50°C;-20°C~60°C | 2016-03-21 | 2017-03-20 |
| Standard Light Source | EVERFINE | D908 | 1012003 | N/A | 2015-09-08 | 2016-09-07 |

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=1.8% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=20K (K=2), at the 95% confidence level. The uncertainty of the CRI is U=1.8(K=2), at the 95% confidence level.

The uncertainty of power meter AC current U=0.19 % of rdg, AC Voltage U=0.15% of rdg, Power U=0.20%) (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=1.6% (K=2) , at the 95% confidence level.

**Fidelity Index and Gamut Index Calculation**

The $R_f$, $R_g$ was calculated according to IES TM-30-15 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: **0.5hour**

Test orientation: **Downward**

### Photometric and Electrical Measurement Result

| Voltage (V) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | Luminous Flux(lm) | Efficacy (lm/W) |
|---|---|---|---|---|---|---|
| 120.0 | 60 | 0.2377 | 28.01 | 0.9818 | 3320.7 | 118.54 |

| Radiant Flux (W) | CCT (K) | Duv | x | y | u' | v' |
|---|---|---|---|---|---|---|
| 10.103 | 4052 | -0.00066 | 0.3777 | 0.3737 | 0.2246 | 0.4998 |

### Color Rendering Index

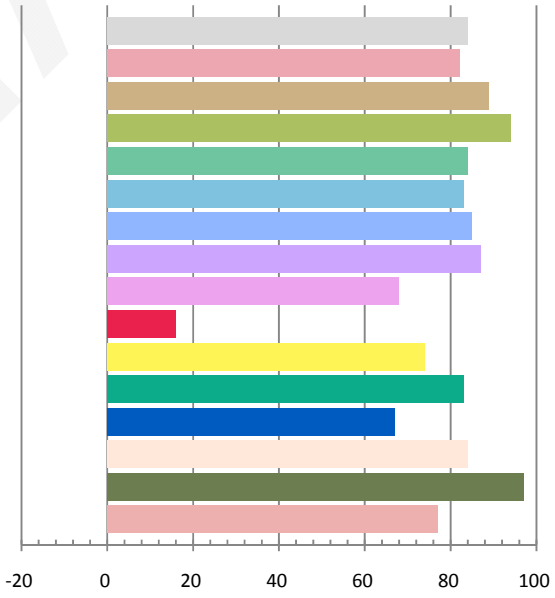
| Ra |
|---|
| **84.0** |

| R1 | R2 | R3 | R4 |
|---|---|---|---|
| 82 | 89 | 94 | 84 |

| R5 | R6 | R7 | R8 |
|---|---|---|---|
| 83 | 85 | 87 | 68 |

| R9 | R10 | R11 | R12 |
|---|---|---|---|
| 16 | 74 | 83 | 67 |

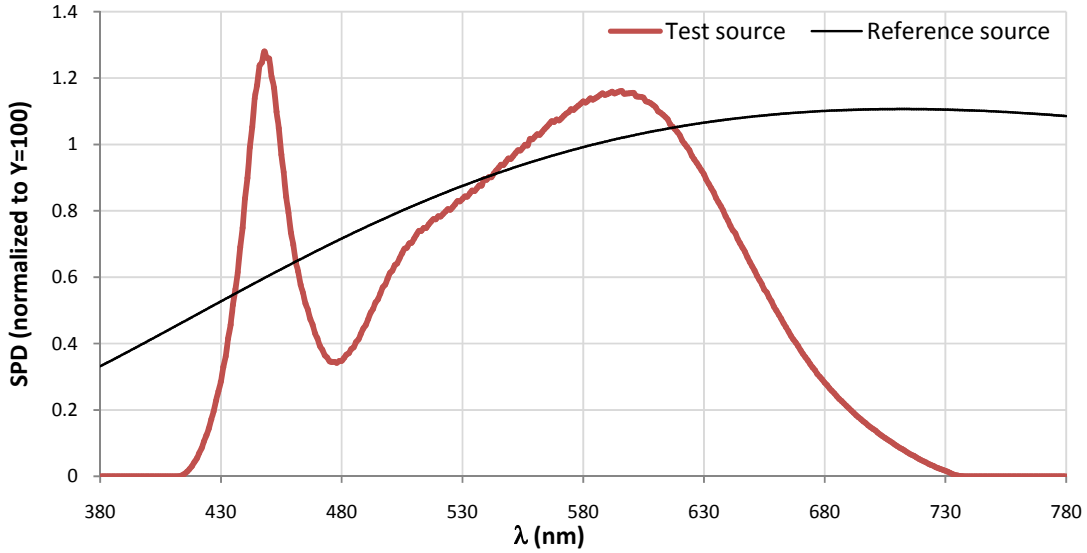
| R13 | R14 | R15 |
|---|---|---|
| 84 | 97 | 77 |



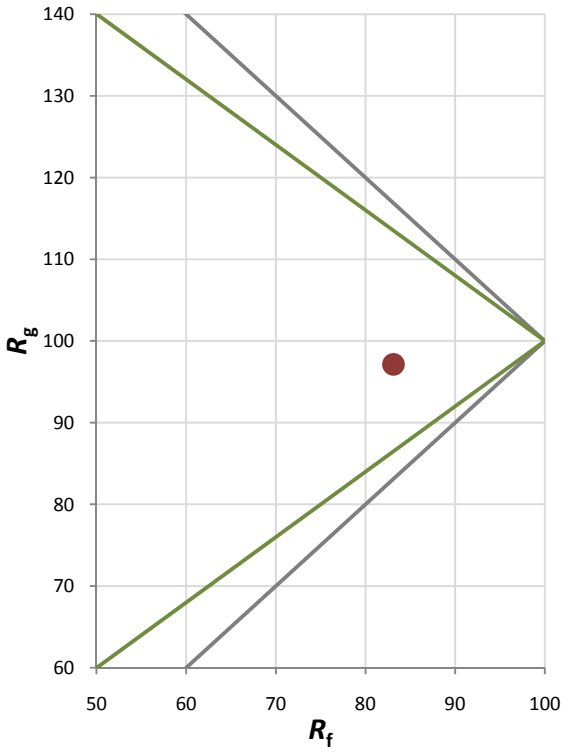
## Fidelity Index and Gamut Index

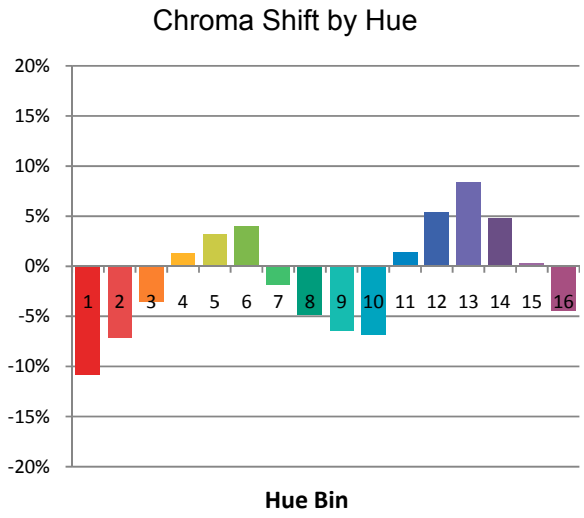
| | |
|---|---|
| Fidelity Index $R_f$ | 83 |
| Gamut Index $R_g$ | 97 |

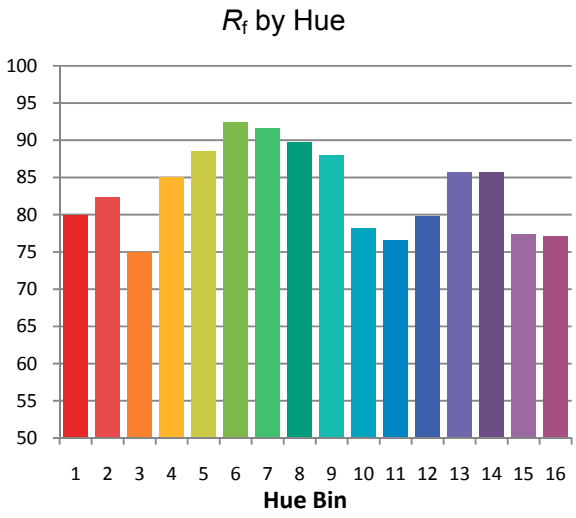
## Spectral Power Distribution Comparison

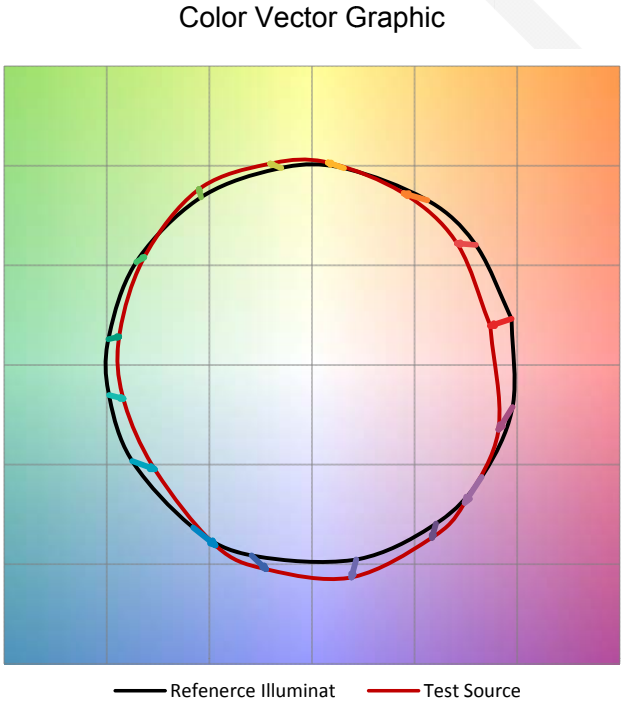


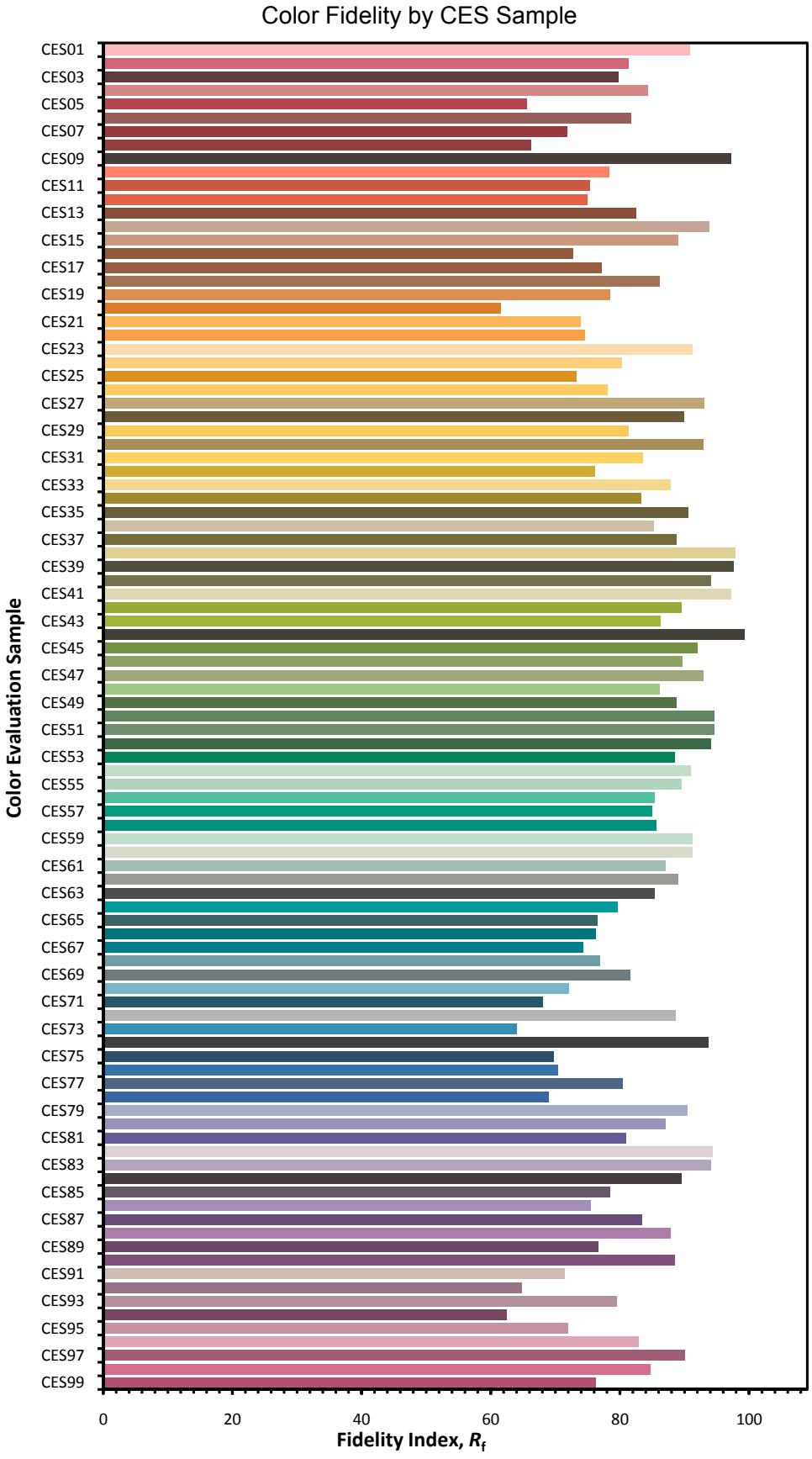

## Plot of $R_g$ versus $R_f$




Chroma Shift by Hue
20%
15%
10%
5%
0%
-5%
-10%
-15%
-20%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Hue Bin


$R_f$ by Hue
100
95
90
85
80
75
70
65
60
55
50
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Hue Bin


Color Vector Graphic
Refenerce Illuminat
Test Source


Color Fidelity by CES Sample
Color Evaluation Sample
CES01
CES03
CES05
CES07
CES09
CES11
CES13
CES15
CES17
CES19
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CES23
CES25
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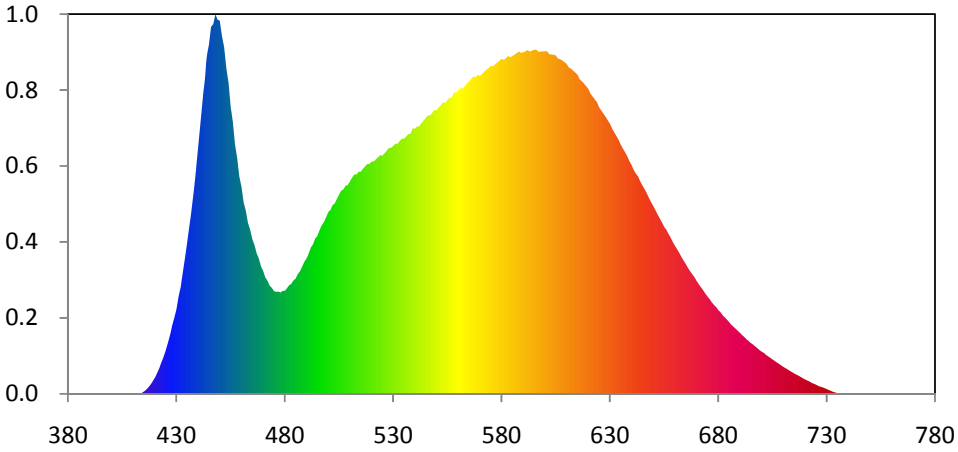
CES79
CES81
CES83
CES85
CES87
CES89
CES91
CES93
CES95
CES97
CES99
0
20
40
60
80
100
Fidelity Index, $R_f$

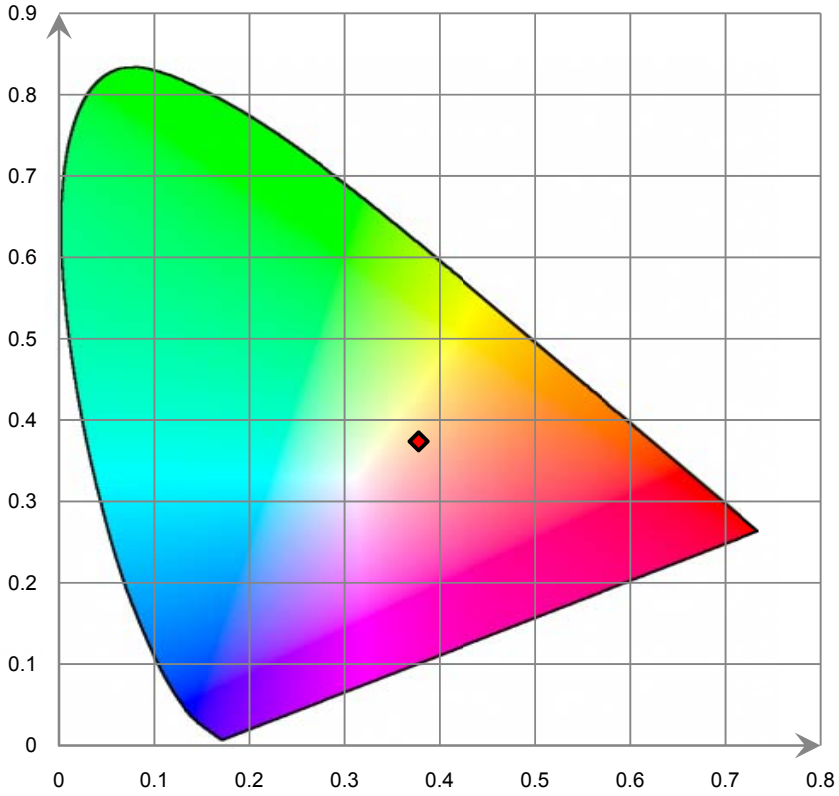
Relative Spectral Power Distribution



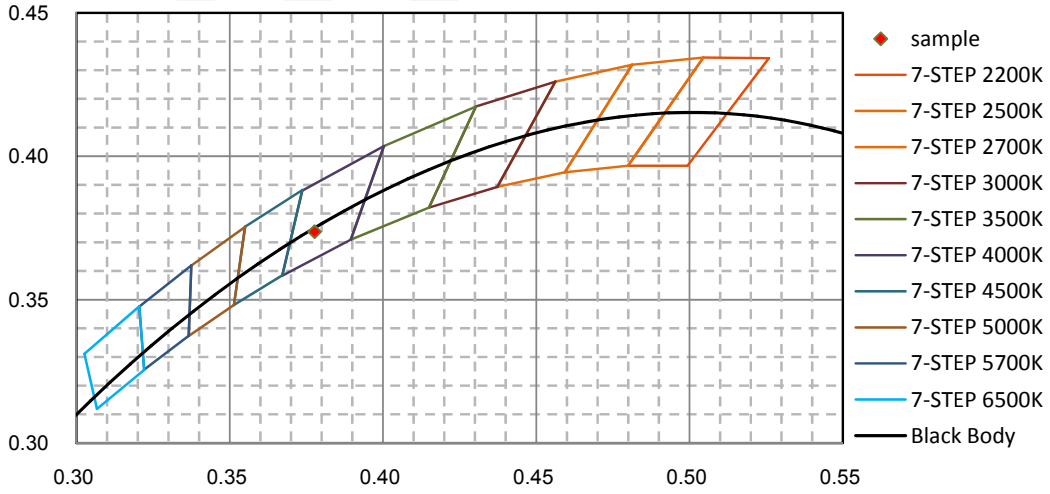

| nm | mW | nm | mW | nm | mW | nm | mW | nm | mW |
|---|---|---|---|---|---|---|---|---|---|
| 380 | 0.000E+00 | 421 | 3.384E+00 | 462 | 3.003E+01 | 503 | 3.121E+01 | 544 | 4.480E+01 |
| 381 | 0.000E+00 | 422 | 4.122E+00 | 463 | 2.806E+01 | 504 | 3.197E+01 | 545 | 4.521E+01 |
| 382 | 0.000E+00 | 423 | 5.127E+00 | 464 | 2.689E+01 | 505 | 3.265E+01 | 546 | 4.566E+01 |
| 383 | 0.000E+00 | 424 | 6.021E+00 | 465 | 2.532E+01 | 506 | 3.334E+01 | 547 | 4.563E+01 |
| 384 | 0.000E+00 | 425 | 6.986E+00 | 466 | 2.443E+01 | 507 | 3.349E+01 | 548 | 4.608E+01 |
| 385 | 0.000E+00 | 426 | 8.357E+00 | 467 | 2.304E+01 | 508 | 3.412E+01 | 549 | 4.656E+01 |
| 386 | 0.000E+00 | 427 | 9.494E+00 | 468 | 2.222E+01 | 509 | 3.423E+01 | 550 | 4.650E+01 |
| 387 | 0.000E+00 | 428 | 1.112E+01 | 469 | 2.092E+01 | 510 | 3.483E+01 | 551 | 4.692E+01 |
| 388 | 0.000E+00 | 429 | 1.246E+01 | 470 | 2.018E+01 | 511 | 3.541E+01 | 552 | 4.735E+01 |
| 389 | 0.000E+00 | 430 | 1.389E+01 | 471 | 1.909E+01 | 512 | 3.595E+01 | 553 | 4.778E+01 |
| 390 | 0.000E+00 | 431 | 1.597E+01 | 472 | 1.855E+01 | 513 | 3.595E+01 | 554 | 4.774E+01 |
| 391 | 0.000E+00 | 432 | 1.759E+01 | 473 | 1.776E+01 | 514 | 3.639E+01 | 555 | 4.814E+01 |
| 392 | 0.000E+00 | 433 | 2.017E+01 | 474 | 1.741E+01 | 515 | 3.640E+01 | 556 | 4.858E+01 |
| 393 | 0.000E+00 | 434 | 2.221E+01 | 475 | 1.686E+01 | 516 | 3.690E+01 | 557 | 4.849E+01 |
| 394 | 0.000E+00 | 435 | 2.510E+01 | 476 | 1.674E+01 | 517 | 3.729E+01 | 558 | 4.942E+01 |
| 395 | 0.000E+00 | 436 | 2.741E+01 | 477 | 1.678E+01 | 518 | 3.770E+01 | 559 | 4.938E+01 |
| 396 | 0.000E+00 | 437 | 2.990E+01 | 478 | 1.663E+01 | 519 | 3.767E+01 | 560 | 4.974E+01 |
| 397 | 0.000E+00 | 438 | 3.357E+01 | 479 | 1.688E+01 | 520 | 3.811E+01 | 561 | 5.011E+01 |
| 398 | 0.000E+00 | 439 | 3.642E+01 | 480 | 1.691E+01 | 521 | 3.806E+01 | 562 | 5.003E+01 |
| 399 | 0.000E+00 | 440 | 4.073E+01 | 481 | 1.734E+01 | 522 | 3.844E+01 | 563 | 5.045E+01 |
| 400 | 0.000E+00 | 441 | 4.370E+01 | 482 | 1.783E+01 | 523 | 3.878E+01 | 564 | 5.086E+01 |
| 401 | 0.000E+00 | 442 | 4.818E+01 | 483 | 1.804E+01 | 524 | 3.914E+01 | 565 | 5.123E+01 |
| 402 | 0.000E+00 | 443 | 5.117E+01 | 484 | 1.863E+01 | 525 | 3.905E+01 | 566 | 5.162E+01 |
| 403 | 0.000E+00 | 444 | 5.537E+01 | 485 | 1.892E+01 | 526 | 3.944E+01 | 567 | 5.203E+01 |
| 404 | 0.000E+00 | 445 | 5.728E+01 | 486 | 1.967E+01 | 527 | 3.986E+01 | 568 | 5.192E+01 |
| 405 | 0.000E+00 | 446 | 6.015E+01 | 487 | 2.009E+01 | 528 | 4.033E+01 | 569 | 5.228E+01 |
| 406 | 0.000E+00 | 447 | 6.062E+01 | 488 | 2.087E+01 | 529 | 4.030E+01 | 570 | 5.215E+01 |
| 407 | 0.000E+00 | 448 | 6.224E+01 | 489 | 2.168E+01 | 530 | 4.064E+01 | 571 | 5.245E+01 |
| 408 | 0.000E+00 | 449 | 6.132E+01 | 490 | 2.216E+01 | 531 | 4.101E+01 | 572 | 5.283E+01 |
| 409 | 0.000E+00 | 450 | 6.118E+01 | 491 | 2.305E+01 | 532 | 4.098E+01 | 573 | 5.314E+01 |
| 410 | 0.000E+00 | 451 | 5.860E+01 | 492 | 2.399E+01 | 533 | 4.144E+01 | 574 | 5.339E+01 |
| 411 | 0.000E+00 | 452 | 5.690E+01 | 493 | 2.452E+01 | 534 | 4.186E+01 | 575 | 5.378E+01 |
| 412 | 1.700E-03 | 453 | 5.340E+01 | 494 | 2.546E+01 | 535 | 4.180E+01 | 576 | 5.369E+01 |
| 413 | 4.160E-02 | 454 | 5.098E+01 | 495 | 2.592E+01 | 536 | 4.220E+01 | 577 | 5.401E+01 |
| 414 | 1.613E-01 | 455 | 4.713E+01 | 496 | 2.679E+01 | 537 | 4.263E+01 | 578 | 5.431E+01 |
| 415 | 3.768E-01 | 456 | 4.454E+01 | 497 | 2.766E+01 | 538 | 4.262E+01 | 579 | 5.460E+01 |
| 416 | 6.897E-01 | 457 | 4.095E+01 | 498 | 2.808E+01 | 539 | 4.355E+01 | 580 | 5.492E+01 |
| 417 | 1.053E+00 | 458 | 3.863E+01 | 499 | 2.894E+01 | 540 | 4.345E+01 | 581 | 5.476E+01 |
| 418 | 1.481E+00 | 459 | 3.568E+01 | 500 | 2.979E+01 | 541 | 4.385E+01 | 582 | 5.504E+01 |
| 419 | 2.053E+00 | 460 | 3.390E+01 | 501 | 3.014E+01 | 542 | 4.383E+01 | 583 | 5.537E+01 |
| 420 | 2.611E+00 | 461 | 3.142E+01 | 502 | 3.094E+01 | 543 | 4.436E+01 | 584 | 5.519E+01 |

| nm | mW | nm | mW | nm | mW | nm | mW | nm | mW |
|---|---|---|---|---|---|---|---|---|---|
| 585 | 5.539E+01 | 626 | 4.643E+01 | 667 | 2.008E+01 | 708 | 4.940E+00 | 749 | 0.000E+00 |
| 586 | 5.561E+01 | 627 | 4.591E+01 | 668 | 1.960E+01 | 709 | 4.672E+00 | 750 | 0.000E+00 |
| 587 | 5.586E+01 | 628 | 4.541E+01 | 669 | 1.911E+01 | 710 | 4.427E+00 | 751 | 0.000E+00 |
| 588 | 5.612E+01 | 629 | 4.484E+01 | 670 | 1.848E+01 | 711 | 4.212E+00 | 752 | 0.000E+00 |
| 589 | 5.588E+01 | 630 | 4.427E+01 | 671 | 1.796E+01 | 712 | 4.015E+00 | 753 | 0.000E+00 |
| 590 | 5.599E+01 | 631 | 4.346E+01 | 672 | 1.746E+01 | 713 | 3.786E+00 | 754 | 0.000E+00 |
| 591 | 5.615E+01 | 632 | 4.285E+01 | 673 | 1.699E+01 | 714 | 3.562E+00 | 755 | 0.000E+00 |
| 592 | 5.635E+01 | 633 | 4.223E+01 | 674 | 1.644E+01 | 715 | 3.349E+00 | 756 | 0.000E+00 |
| 593 | 5.610E+01 | 634 | 4.165E+01 | 675 | 1.598E+01 | 716 | 3.160E+00 | 757 | 0.000E+00 |
| 594 | 5.625E+01 | 635 | 4.080E+01 | 676 | 1.553E+01 | 717 | 3.001E+00 | 758 | 0.000E+00 |
| 595 | 5.638E+01 | 636 | 4.019E+01 | 677 | 1.500E+01 | 718 | 2.776E+00 | 759 | 0.000E+00 |
| 596 | 5.645E+01 | 637 | 3.957E+01 | 678 | 1.458E+01 | 719 | 2.561E+00 | 760 | 0.000E+00 |
| 597 | 5.606E+01 | 638 | 3.895E+01 | 679 | 1.420E+01 | 720 | 2.382E+00 | 761 | 0.000E+00 |
| 598 | 5.610E+01 | 639 | 3.811E+01 | 680 | 1.372E+01 | 721 | 2.198E+00 | 762 | 0.000E+00 |
| 599 | 5.611E+01 | 640 | 3.749E+01 | 681 | 1.337E+01 | 722 | 2.047E+00 | 763 | 0.000E+00 |
| 600 | 5.617E+01 | 641 | 3.667E+01 | 682 | 1.290E+01 | 723 | 1.844E+00 | 764 | 0.000E+00 |
| 601 | 5.615E+01 | 642 | 3.605E+01 | 683 | 1.253E+01 | 724 | 1.678E+00 | 765 | 0.000E+00 |
| 602 | 5.567E+01 | 643 | 3.562E+01 | 684 | 1.216E+01 | 725 | 1.528E+00 | 766 | 0.000E+00 |
| 603 | 5.563E+01 | 644 | 3.478E+01 | 685 | 1.175E+01 | 726 | 1.340E+00 | 767 | 0.000E+00 |
| 604 | 5.559E+01 | 645 | 3.414E+01 | 686 | 1.134E+01 | 727 | 1.192E+00 | 768 | 0.000E+00 |
| 605 | 5.548E+01 | 646 | 3.350E+01 | 687 | 1.101E+01 | 728 | 1.068E+00 | 769 | 0.000E+00 |
| 606 | 5.496E+01 | 647 | 3.289E+01 | 688 | 1.067E+01 | 729 | 9.474E-01 | 770 | 0.000E+00 |
| 607 | 5.483E+01 | 648 | 3.209E+01 | 689 | 1.033E+01 | 730 | 7.967E-01 | 771 | 0.000E+00 |
| 608 | 5.465E+01 | 649 | 3.142E+01 | 690 | 1.000E+01 | 731 | 6.677E-01 | 772 | 0.000E+00 |
| 609 | 5.437E+01 | 650 | 3.076E+01 | 691 | 9.632E+00 | 732 | 4.974E-01 | 773 | 0.000E+00 |
| 610 | 5.409E+01 | 651 | 3.014E+01 | 692 | 9.304E+00 | 733 | 3.282E-01 | 774 | 0.000E+00 |
| 611 | 5.350E+01 | 652 | 2.937E+01 | 693 | 8.938E+00 | 734 | 2.014E-01 | 775 | 0.000E+00 |
| 612 | 5.328E+01 | 653 | 2.877E+01 | 694 | 8.658E+00 | 735 | 1.207E-01 | 776 | 0.000E+00 |
| 613 | 5.300E+01 | 654 | 2.812E+01 | 695 | 8.347E+00 | 736 | 6.140E-02 | 777 | 0.000E+00 |
| 614 | 5.266E+01 | 655 | 2.736E+01 | 696 | 8.065E+00 | 737 | 2.950E-02 | 778 | 0.000E+00 |
| 615 | 5.231E+01 | 656 | 2.693E+01 | 697 | 7.786E+00 | 738 | 1.450E-02 | 779 | 0.000E+00 |
| 616 | 5.159E+01 | 657 | 2.620E+01 | 698 | 7.465E+00 | 739 | 6.800E-03 | 780 | 0.000E+00 |
| 617 | 5.123E+01 | 658 | 2.562E+01 | 699 | 7.184E+00 | 740 | 3.200E-03 | | |
| 618 | 5.086E+01 | 659 | 2.487E+01 | 700 | 6.932E+00 | 741 | 1.500E-03 | | |
| 619 | 5.043E+01 | 660 | 2.428E+01 | 701 | 6.710E+00 | 742 | 7.000E-04 | | |
| 620 | 4.998E+01 | 661 | 2.369E+01 | 702 | 6.398E+00 | 743 | 3.000E-04 | | |
| 621 | 4.920E+01 | 662 | 2.309E+01 | 703 | 6.129E+00 | 744 | 2.000E-04 | | |
| 622 | 4.871E+01 | 663 | 2.242E+01 | 704 | 5.868E+00 | 745 | 1.000E-04 | | |
| 623 | 4.826E+01 | 664 | 2.185E+01 | 705 | 5.628E+00 | 746 | 0.000E+00 | | |
| 624 | 4.779E+01 | 665 | 2.125E+01 | 706 | 5.390E+00 | 747 | 0.000E+00 | | |
| 625 | 4.698E+01 | 666 | 2.060E+01 | 707 | 5.157E+00 | 748 | 0.000E+00 | | |

CIE 1931 x y Chromaticity Diagram




7-Step Chromaticity Quadrangles



## [Goniophotometer System]

Total operating time for luminous intensity distribution: **1.0 hours**

Test orientation: **Downward**

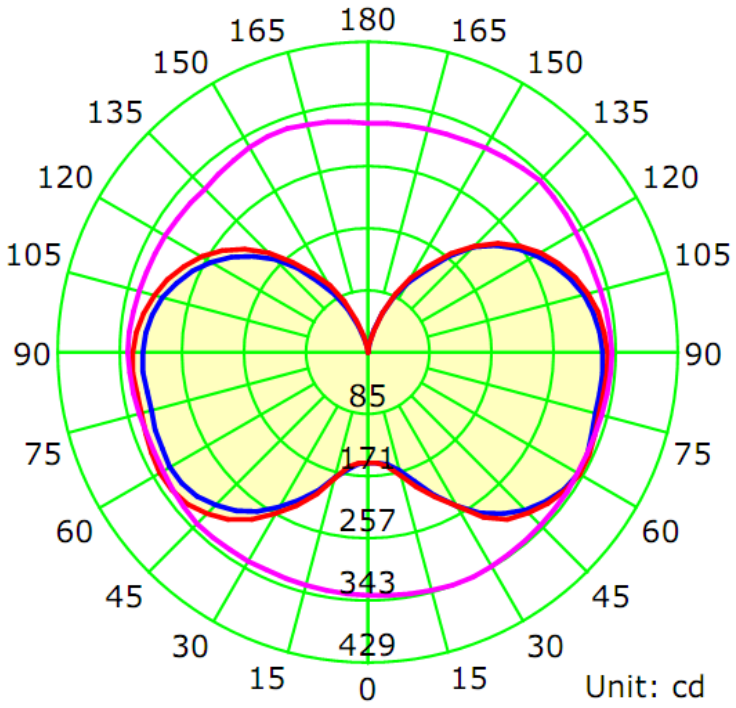
### Electrical Measurement

| Input Voltage (V) | Frequency (Hz) | Input Current (A) | Power (W) | Power Factor |
|---|---|---|---|---|
| 120.0 | 60 | 0.2390 | 28.22 | 0.9840 |

### Photometric Measurement

| Luminous Flux (lm) | Efficacy (lm/W) | $I_{max}$ (cd) | S/MH (C0/180) | S/MH (C90/270) |
|---|---|---|---|---|
| 3346.2 | 118.58 | 343.8 | 2.51 | 2.56 |

### Luminous Intensity Distribution




| | C0/180 | C45/225 | C90/270 | C135/315 | AVG. |
|---|---|---|---|---|---|
| Beam Angle (50% $I_{max}$): | 278.4 | 277.7 | 280.7 | 282.2 | 279.8 |
| Field Angle (10% $I_{max}$): | 326.1 | 325.5 | 327.6 | 327.2 | 326.6 |

Luminous Intensity (cd) Distribution Data

| C / γ | 0° | 22.5° | 45° | 67.5° | 90° | 112.5° | 135° | 157.5° |
|---|---|---|---|---|---|---|---|---|
| 0.0° | 154 | 154 | 154 | 154 | 154 | 154 | 154 | 154 |
| 5.0° | 154 | 155 | 155 | 155 | 154 | 155 | 155 | 154 |
| 10.0° | 157 | 159 | 159 | 157 | 161 | 157 | 164 | 158 |
| 15.0° | 169 | 172 | 174 | 167 | 178 | 166 | 183 | 169 |
| 20.0° | 190 | 193 | 195 | 186 | 199 | 187 | 205 | 191 |
| 25.0° | 218 | 223 | 220 | 209 | 221 | 210 | 225 | 212 |
| 30.0° | 245 | 244 | 244 | 233 | 245 | 234 | 250 | 234 |
| 35.0° | 271 | 269 | 272 | 260 | 279 | 262 | 282 | 258 |
| 40.0° | 292 | 292 | 295 | 285 | 301 | 287 | 303 | 279 |
| 45.0° | 309 | 312 | 311 | 304 | 314 | 305 | 313 | 296 |
| 50.0° | 322 | 329 | 325 | 318 | 326 | 318 | 323 | 309 |
| 55.0° | 331 | 339 | 334 | 328 | 334 | 326 | 332 | 317 |
| 60.0° | 336 | 344 | 339 | 334 | 338 | 332 | 336 | 322 |
| 65.0° | 336 | 343 | 339 | 335 | 338 | 330 | 336 | 322 |
| 70.0° | 330 | 339 | 335 | 329 | 334 | 329 | 331 | 318 |
| 75.0° | 327 | 334 | 331 | 328 | 332 | 324 | 328 | 316 |
| 80.0° | 326 | 333 | 329 | 326 | 331 | 323 | 328 | 316 |
| 85.0° | 327 | 333 | 330 | 328 | 332 | 325 | 330 | 318 |
| 90.0° | 325 | 333 | 330 | 328 | 332 | 325 | 329 | 317 |
| 95.0° | 323 | 330 | 327 | 325 | 328 | 323 | 326 | 314 |
| 100.0° | 317 | 326 | 322 | 320 | 324 | 317 | 321 | 307 |
| 105.0° | 310 | 318 | 315 | 312 | 316 | 309 | 313 | 298 |
| 110.0° | 299 | 307 | 304 | 301 | 306 | 299 | 302 | 286 |
| 115.0° | 285 | 294 | 291 | 287 | 292 | 285 | 288 | 272 |
| 120.0° | 270 | 277 | 274 | 269 | 277 | 268 | 271 | 255 |
| 125.0° | 252 | 257 | 255 | 249 | 257 | 249 | 253 | 236 |
| 130.0° | 232 | 235 | 232 | 227 | 235 | 225 | 230 | 215 |
| 135.0° | 208 | 207 | 207 | 200 | 209 | 195 | 204 | 188 |
| 140.0° | 175 | 173 | 176 | 167 | 179 | 161 | 175 | 159 |
| 145.0° | 139 | 140 | 145 | 134 | 146 | 132 | 140 | 129 |
| 150.0° | 112 | 110 | 117 | 106 | 119 | 107 | 112 | 105 |
| 155.0° | 84 | 79 | 87 | 79 | 90 | 83 | 84 | 72 |
| 160.0° | 56 | 52 | 58 | 50 | 59 | 48 | 52 | 42 |
| 165.0° | 33 | 23 | 33 | 26 | 32 | 24 | 26 | 21 |
| 170.0° | 14 | 8 | 13 | 9 | 11 | 8 | 8 | 7 |
| 175.0° | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| 180.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Luminous Intensity (cd) Distribution Data (cont.)

| C / γ | 180° | 202.5° | 225° | 247.5° | 270° | 292.5° | 315° | 337.5° |
|---|---|---|---|---|---|---|---|---|
| 0.0° | 154 | 154 | 154 | 154 | 154 | 154 | 154 | 154 |
| 5.0° | 155 | 154 | 155 | 155 | 154 | 155 | 155 | 155 |
| 10.0° | 165 | 160 | 163 | 162 | 161 | 163 | 159 | 162 |
| 15.0° | 180 | 176 | 179 | 180 | 180 | 177 | 173 | 175 |
| 20.0° | 204 | 202 | 201 | 205 | 209 | 198 | 198 | 194 |
| 25.0° | 225 | 227 | 222 | 229 | 234 | 220 | 229 | 220 |
| 30.0° | 248 | 251 | 248 | 250 | 258 | 254 | 258 | 253 |
| 35.0° | 269 | 277 | 271 | 271 | 282 | 274 | 280 | 273 |
| 40.0° | 286 | 298 | 289 | 290 | 303 | 289 | 301 | 291 |
| 45.0° | 299 | 313 | 301 | 305 | 316 | 301 | 314 | 306 |
| 50.0° | 310 | 324 | 312 | 317 | 327 | 312 | 325 | 319 |
| 55.0° | 316 | 329 | 318 | 323 | 332 | 320 | 332 | 328 |
| 60.0° | 318 | 331 | 321 | 326 | 334 | 326 | 335 | 333 |
| 65.0° | 315 | 330 | 319 | 321 | 331 | 326 | 335 | 333 |
| 70.0° | 314 | 326 | 316 | 320 | 328 | 322 | 328 | 328 |
| 75.0° | 311 | 324 | 312 | 320 | 325 | 319 | 325 | 326 |
| 80.0° | 311 | 325 | 313 | 320 | 326 | 319 | 324 | 326 |
| 85.0° | 314 | 326 | 315 | 320 | 327 | 320 | 327 | 327 |
| 90.0° | 312 | 325 | 313 | 319 | 327 | 319 | 325 | 324 |
| 95.0° | 310 | 321 | 310 | 316 | 322 | 316 | 323 | 322 |
| 100.0° | 304 | 314 | 303 | 309 | 316 | 309 | 317 | 316 |
| 105.0° | 295 | 305 | 294 | 301 | 307 | 301 | 309 | 307 |
| 110.0° | 283 | 293 | 282 | 289 | 296 | 289 | 299 | 296 |
| 115.0° | 268 | 280 | 268 | 274 | 282 | 274 | 287 | 282 |
| 120.0° | 251 | 264 | 251 | 257 | 266 | 256 | 272 | 263 |
| 125.0° | 231 | 244 | 231 | 237 | 247 | 236 | 255 | 244 |
| 130.0° | 208 | 221 | 207 | 214 | 223 | 212 | 235 | 220 |
| 135.0° | 183 | 193 | 180 | 185 | 196 | 184 | 210 | 190 |
| 140.0° | 153 | 162 | 148 | 150 | 164 | 151 | 179 | 155 |
| 145.0° | 120 | 130 | 119 | 120 | 134 | 120 | 138 | 123 |
| 150.0° | 93 | 103 | 92 | 96 | 108 | 94 | 105 | 95 |
| 155.0° | 66 | 74 | 64 | 68 | 78 | 69 | 77 | 70 |
| 160.0° | 39 | 42 | 37 | 37 | 47 | 36 | 48 | 40 |
| 165.0° | 17 | 20 | 17 | 15 | 25 | 16 | 29 | 17 |
| 170.0° | 5 | 6 | 5 | 5 | 7 | 5 | 10 | 6 |
| 175.0° | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| 180.0° | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

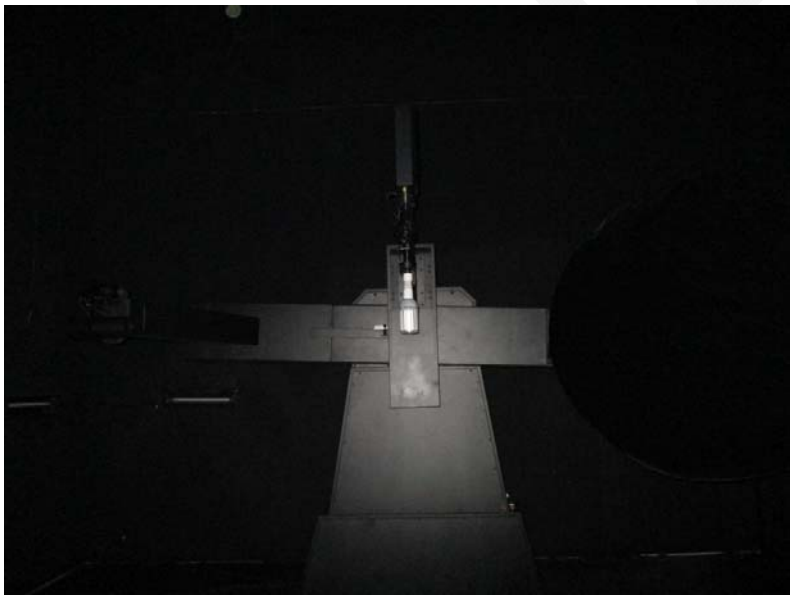
Zonal Lumen Density Measurement

| Deg | Flux (lm) | % |
|---|---|---|
| 0-5 | 3.7 | 0.11 |
| 5-10 | 11.3 | 0.34 |
| 10-15 | 19.9 | 0.59 |
| 15-20 | 30.7 | 0.92 |
| 20-25 | 43.9 | 1.31 |
| 25-30 | 59.3 | 1.77 |
| 30-35 | 76.4 | 2.28 |
| 35-40 | 94.1 | 2.81 |
| 40-45 | 111.0 | 3.32 |
| 45-50 | 126.7 | 3.79 |
| 50-55 | 140.7 | 4.21 |
| 55-60 | 152.3 | 4.55 |
| 60-65 | 161.0 | 4.81 |
| 65-70 | 166.4 | 4.97 |
| 70-75 | 170.0 | 5.08 |
| 75-80 | 173.2 | 5.18 |
| 80-85 | 176.2 | 5.26 |
| 85-90 | 177.7 | 5.31 |
| 90-95 | 176.6 | 5.28 |
| 95-100 | 172.8 | 5.17 |
| 100-105 | 166.5 | 4.97 |
| 105-110 | 157.5 | 4.71 |
| 110-115 | 146.2 | 4.37 |
| 115-120 | 132.9 | 3.97 |
| 120-125 | 118.1 | 3.53 |
| 125-130 | 102.0 | 3.05 |
| 130-135 | 84.7 | 2.53 |
| 135-140 | 66.7 | 1.99 |
| 140-145 | 49.4 | 1.48 |
| 145-150 | 34.8 | 1.04 |
| 150-155 | 22.9 | 0.68 |
| 155-160 | 12.9 | 0.39 |
| 160-165 | 5.7 | 0.17 |
| 165-170 | 1.8 | 0.06 |
| 170-175 | 0.3 | 0.01 |
| 175-180 | 0.0 | 0.00 |

| Deg | Flux (lm) | % |
|---|---|---|
| 0-5 | 3.7 | 0.11 |
| 0-10 | 14.9 | 0.45 |
| 0-15 | 34.8 | 1.04 |
| 0-20 | 65.5 | 1.96 |
| 0-25 | 109.4 | 3.27 |
| 0-30 | 168.7 | 5.04 |
| 0-35 | 245.0 | 7.32 |
| 0-40 | 339.2 | 10.14 |
| 0-45 | 450.2 | 13.45 |
| 0-50 | 576.9 | 17.24 |
| 0-55 | 717.6 | 21.45 |
| 0-60 | 870.0 | 26.00 |
| 0-65 | 1030.9 | 30.81 |
| 0-70 | 1197.3 | 35.78 |
| 0-75 | 1367.3 | 40.86 |
| 0-80 | 1540.5 | 46.04 |
| 0-85 | 1716.7 | 51.30 |
| 0-90 | 1894.3 | 56.61 |
| 0-95 | 2070.9 | 61.89 |
| 0-100 | 2243.7 | 67.05 |
| 0-105 | 2410.2 | 72.03 |
| 0-110 | 2567.7 | 76.73 |
| 0-115 | 2713.9 | 81.10 |
| 0-120 | 2846.8 | 85.08 |
| 0-125 | 2964.9 | 88.60 |
| 0-130 | 3066.9 | 91.65 |
| 0-135 | 3151.6 | 94.18 |
| 0-140 | 3218.3 | 96.18 |
| 0-145 | 3267.7 | 97.65 |
| 0-150 | 3302.5 | 98.69 |
| 0-155 | 3325.4 | 99.38 |
| 0-160 | 3338.3 | 99.76 |
| 0-165 | 3344.1 | 99.93 |
| 0-170 | 3345.9 | 99.99 |
| 0-175 | 3346.2 | 100.00 |
| 0-180 | 3346.2 | 100.00 |

## 6. Product Photo


## 7. Product Test orientation in the Goniophotometer



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