

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: LE199027DIM120VNR6BL

| | |
|-----------------------|--|
| Report Type: | Electrical and Photometric tests including: Input Current, Power, Power Factor, Luminous Flux, Luminous Efficacy, CRI, CCT, Chromaticity Coordinate, Spectral Power Distribution |
| Test Engineer: | George Yang <i>George Yang</i> |
| Report Number: | RKSB190329024-10-4 |
| Test Date: | 2019-04-09 |
| Report Date: | 2019-05-07 |
| Reviewed By: | Ray Gao/EE Engineer <i>Ray Gao</i> |
| Prepared By: | Bay Area Compliance Laboratories Corp. (Kunshan). No.248 Chenghu Road, Kunshan, Jiangsu province, China. Tel: +86-0512-86175000 Fax: +86-0512-88934268 |
| Test Facility: | Test facility was located at No.248 Chenghu Road, Kunshan, Jiangsu province, China. |
| Accreditation: | The IAS Accreditation Number TL-749. |

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Kunshan). 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.

1. Product Description

General Information:

One sample was received on 2018-03-29 and used for testing.

Model Tested: LE199027DIM120VNR6BL
Manufacturer: GREEN CREATIVE LTD
Brand Name: GREEN CREATIVE
Product Designation: LED Recessed Downlight
Aging Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120-277VAC 60Hz
Rated Power: 31W
Nominal CCT: 2700K
Nominal Lumen Output: 1950lm

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 Equipment
- IES TM-30-15: IES Method for Evaluating Light Source Color Rendition

3. Description of Test Equipment

| Device | Manufacture | Model No | Serial No | Calibration date | Calibration due date |
|-----------------------|-------------|----------|-------------|------------------|----------------------|
| Integrating Sphere | INVENTFINE | Dia 1.5m | JWWCV090112 | 2019-01-23 | 2020-01-23 |
| Power Meter | INVENTFINE | WT500 | GSJWQ20009 | 2019-04-08 | 2020-04-08 |
| Spectral photometer | INVENTFINE | CMS-3S | GSGSE100017 | 2019-01-23 | 2020-01-23 |
| AC Power Supply | INVENTFINE | CHP500 | JWJSD010071 | 2019-04-08 | 2020-04-08 |
| Standard Light Source | INVENTFINE | N/A | JWWCR020106 | 2018-12-24 | 2019-12-24 |
| Thermal Meter | KEJIAN | TA298 | N/A | 2018-12-01 | 2019-12-01 |
| DC Power Supply | INVENTFINE | WL3005 | JWWCP020069 | 2019-04-08 | 2020-04-08 |

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Kunshan) 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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ 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 $U_{re}=2.61\%$ ($k=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=34\text{K}$ ($k=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.5(k=2)$, at the 95% confidence level.

The uncertainty of power meter AC current $U_{re}=0.48\%$ of rdg, AC Voltage $U_{re}=0.25\%$ of rdg, Power $U_{re}=0.44\%$, ($k=2$), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_i , 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: **1.0 hour**

Test orientation: **Downward**

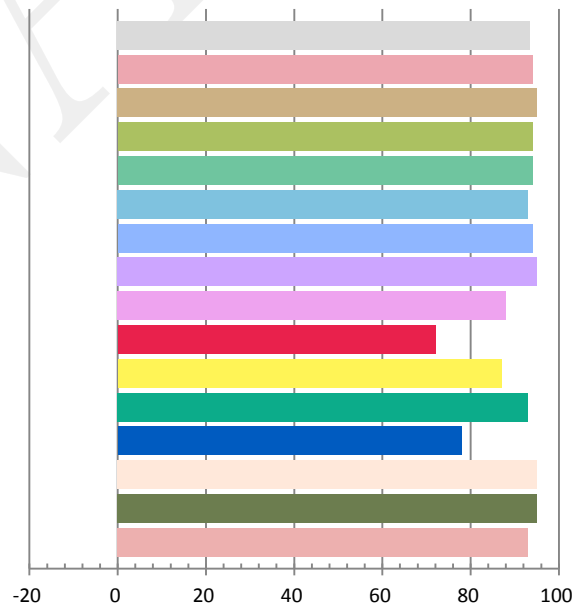
Photometric and Electrical Measurement Result

| Voltage (V) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | Luminous Flux(lm) | Efficacy (lm/W) |
|-------------|----------------|-------------|-----------|--------------|-------------------|-----------------|
| 120 | 60 | 0.2625 | 31.12 | 0.9879 | 2011.29 | 64.63 |

| Radiant Flux (W) | CCT (K) | Duv | x | y | u' | v' |
|------------------|---------|----------|--------|--------|--------|--------|
| 7.346 | 2719 | -0.00004 | 0.4582 | 0.4101 | 0.2617 | 0.5269 |

Color Rendering Index

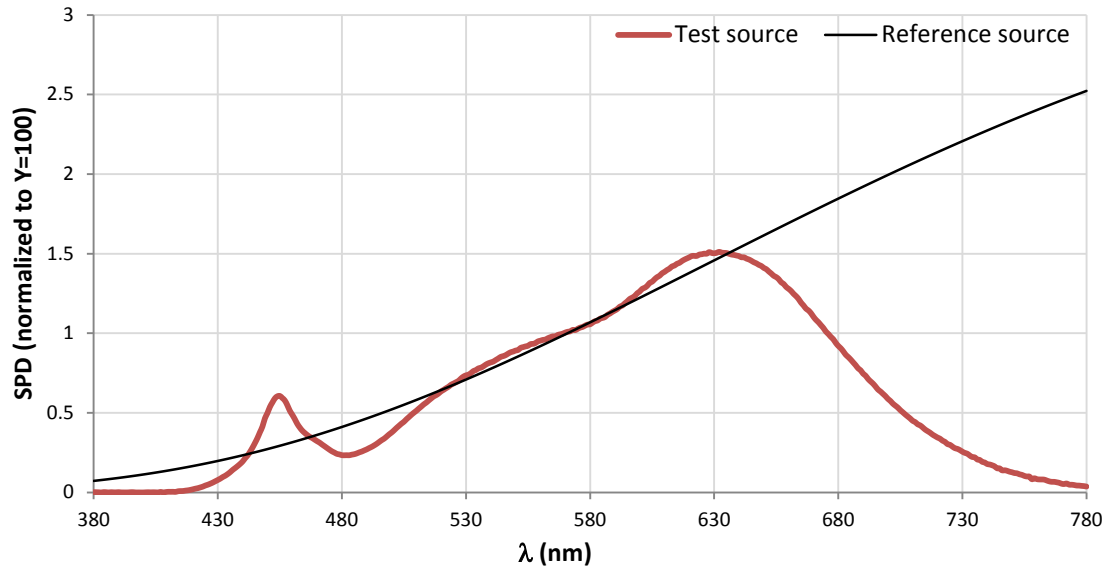
| | | | |
|------------|------------|------------|------------|
| Ra | | | |
| 93.5 | | | |
| R1 | R2 | R3 | R4 |
| 94 | 95 | 94 | 94 |
| R5 | R6 | R7 | R8 |
| 93 | 94 | 95 | 88 |
| R9 | R10 | R11 | R12 |
| 72 | 87 | 93 | 78 |
| R13 | R14 | R15 | |
| 95 | 95 | 93 | |



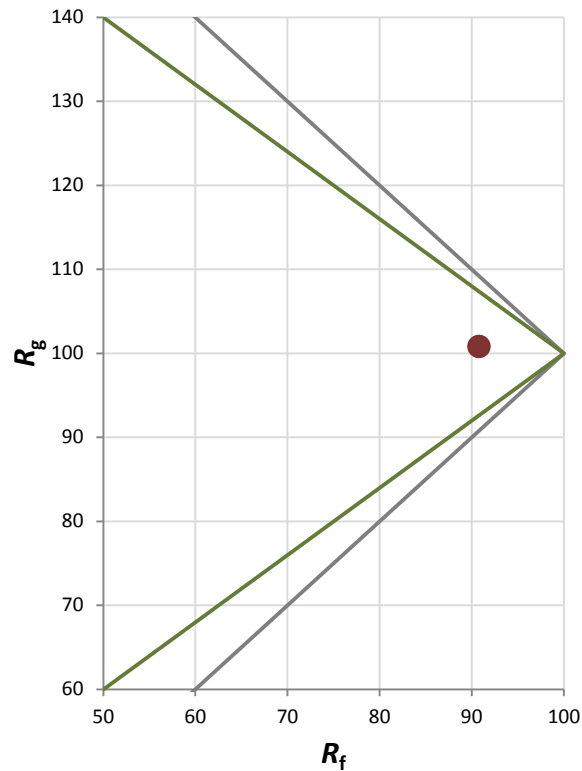
Fidelity Index and Gamut Index

| | |
|----------------------|-----|
| Fidelity Index R_f | 91 |
| Gamut Index R_g | 101 |

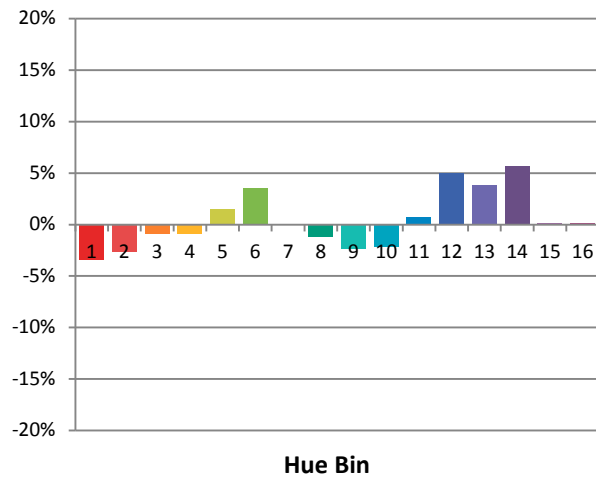
Spectral Power Distribution Comparison



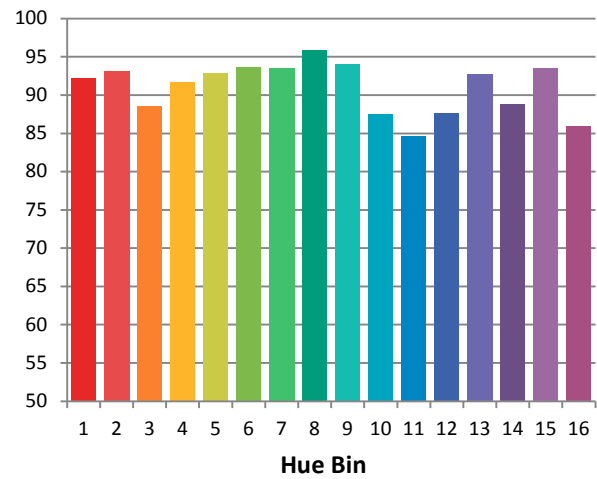
Plot of R_g versus R_f



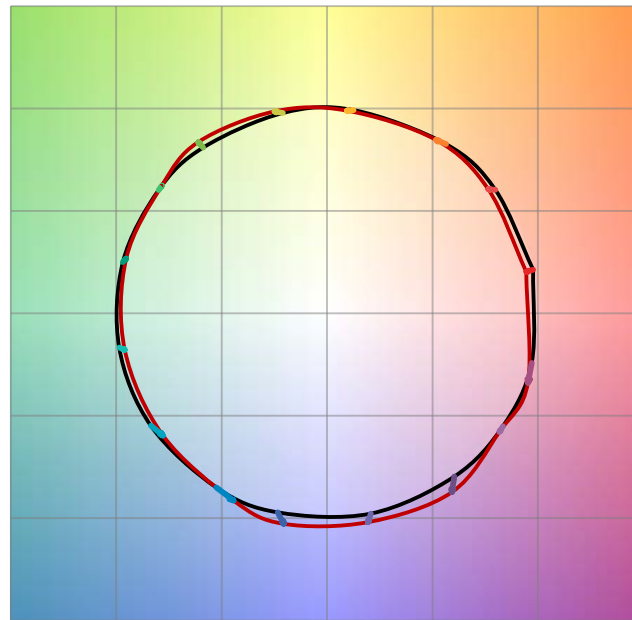
Chroma Shift by Hue



R_t by Hue

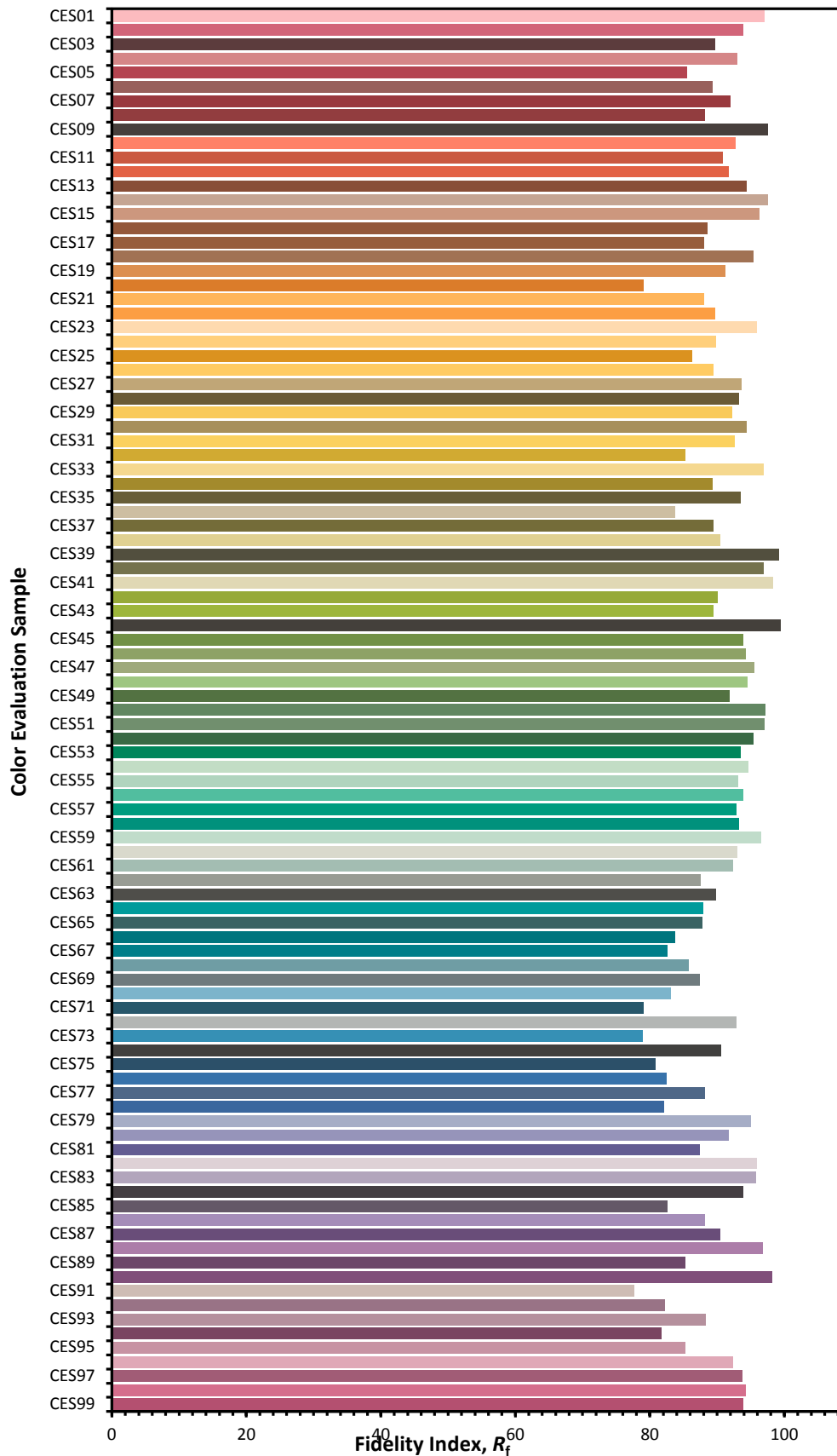


Color Vector Graphic

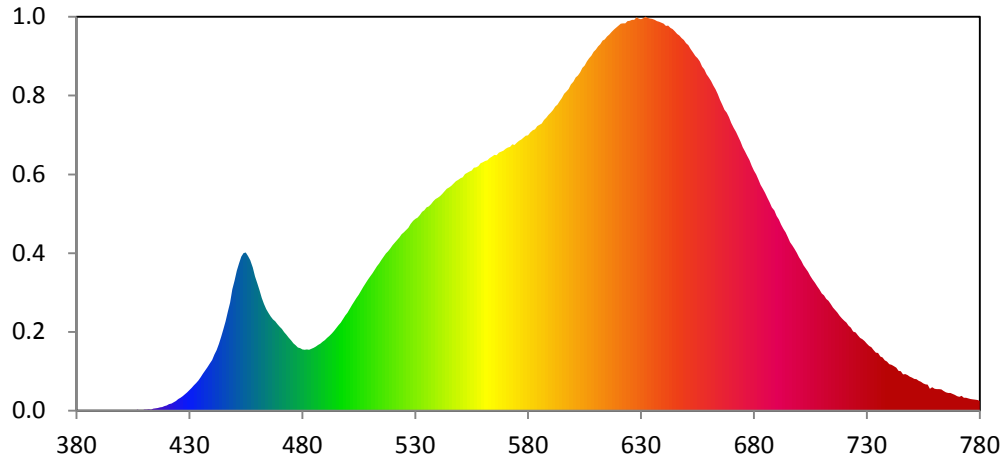


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



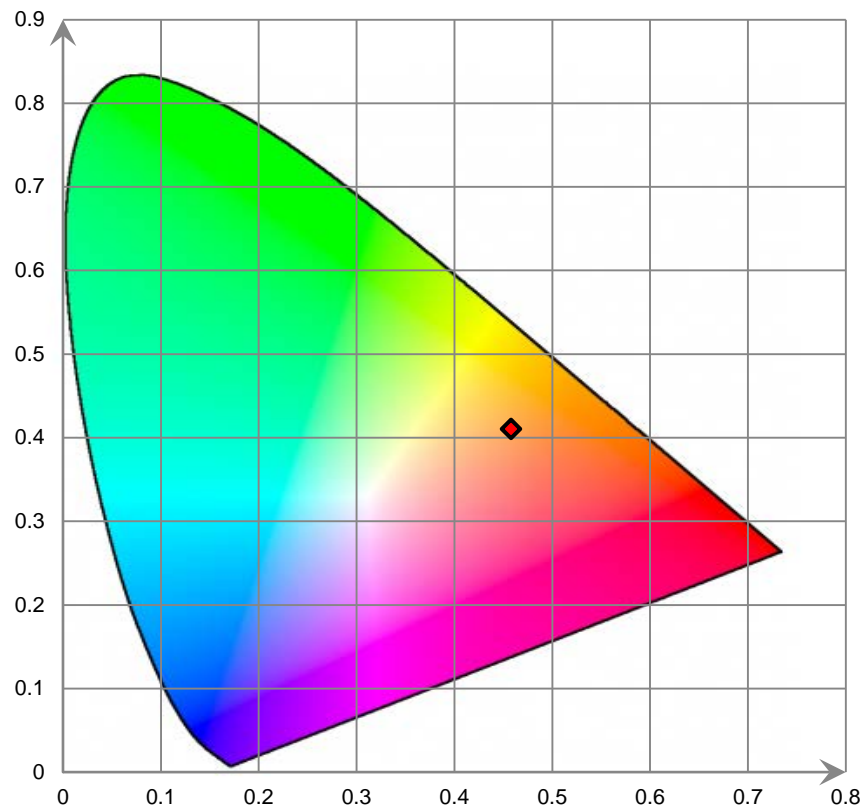
Relative Spectral Power Distribution



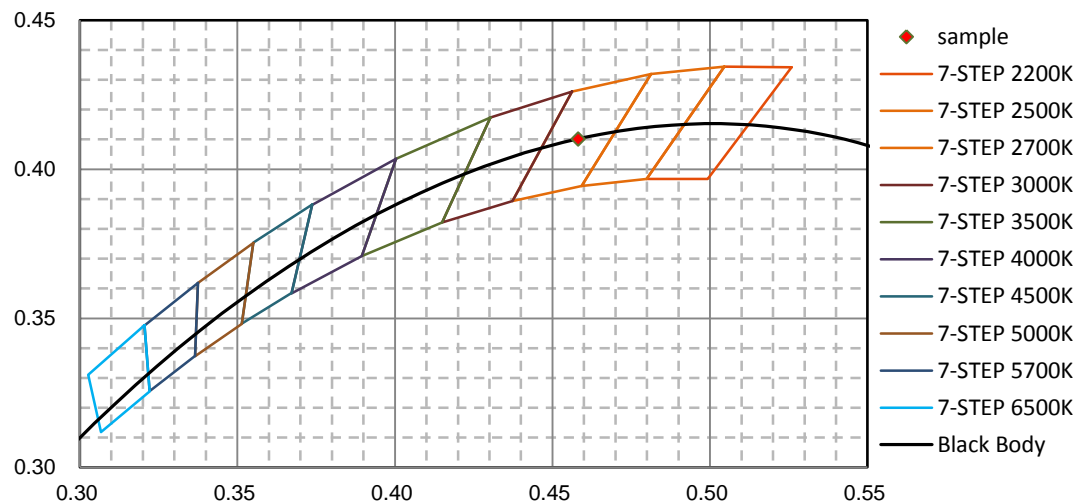
| nm | mW | nm | mW | nm | mW | nm | mW | nm | mW |
|-----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|
| 380 | 6.410E-02 | 421 | 7.066E-01 | 462 | 1.271E+01 | 503 | 1.233E+01 | 544 | 2.509E+01 |
| 381 | 4.770E-02 | 422 | 8.024E-01 | 463 | 1.204E+01 | 504 | 1.273E+01 | 545 | 2.522E+01 |
| 382 | 3.220E-02 | 423 | 9.403E-01 | 464 | 1.146E+01 | 505 | 1.308E+01 | 546 | 2.541E+01 |
| 383 | 1.500E-03 | 424 | 1.087E+00 | 465 | 1.103E+01 | 506 | 1.354E+01 | 547 | 2.569E+01 |
| 384 | 6.470E-02 | 425 | 1.286E+00 | 466 | 1.065E+01 | 507 | 1.395E+01 | 548 | 2.594E+01 |
| 385 | 4.720E-02 | 426 | 1.437E+00 | 467 | 1.031E+01 | 508 | 1.437E+01 | 549 | 2.607E+01 |
| 386 | 6.500E-03 | 427 | 1.627E+00 | 468 | 1.009E+01 | 509 | 1.475E+01 | 550 | 2.626E+01 |
| 387 | 4.930E-02 | 428 | 1.834E+00 | 469 | 9.783E+00 | 510 | 1.511E+01 | 551 | 2.636E+01 |
| 388 | 2.780E-02 | 429 | 2.073E+00 | 470 | 9.491E+00 | 511 | 1.551E+01 | 552 | 2.675E+01 |
| 389 | 2.200E-02 | 430 | 2.308E+00 | 471 | 9.223E+00 | 512 | 1.590E+01 | 553 | 2.689E+01 |
| 390 | 5.540E-02 | 431 | 2.556E+00 | 472 | 8.878E+00 | 513 | 1.630E+01 | 554 | 2.702E+01 |
| 391 | 1.720E-02 | 432 | 2.851E+00 | 473 | 8.561E+00 | 514 | 1.663E+01 | 555 | 2.714E+01 |
| 392 | 9.000E-03 | 433 | 3.094E+00 | 474 | 8.233E+00 | 515 | 1.703E+01 | 556 | 2.745E+01 |
| 393 | 4.700E-03 | 434 | 3.406E+00 | 475 | 7.914E+00 | 516 | 1.740E+01 | 557 | 2.749E+01 |
| 394 | 1.570E-02 | 435 | 3.762E+00 | 476 | 7.610E+00 | 517 | 1.776E+01 | 558 | 2.765E+01 |
| 395 | 5.230E-02 | 436 | 4.171E+00 | 477 | 7.380E+00 | 518 | 1.801E+01 | 559 | 2.796E+01 |
| 396 | 4.940E-02 | 437 | 4.518E+00 | 478 | 7.137E+00 | 519 | 1.833E+01 | 560 | 2.808E+01 |
| 397 | 4.200E-03 | 438 | 4.885E+00 | 479 | 7.045E+00 | 520 | 1.871E+01 | 561 | 2.823E+01 |
| 398 | 6.400E-03 | 439 | 5.278E+00 | 480 | 6.900E+00 | 521 | 1.899E+01 | 562 | 2.830E+01 |
| 399 | 3.000E-04 | 440 | 5.726E+00 | 481 | 6.881E+00 | 522 | 1.930E+01 | 563 | 2.854E+01 |
| 400 | 0.000E+00 | 441 | 6.319E+00 | 482 | 6.895E+00 | 523 | 1.957E+01 | 564 | 2.873E+01 |
| 401 | 2.780E-02 | 442 | 6.846E+00 | 483 | 6.887E+00 | 524 | 1.994E+01 | 565 | 2.889E+01 |
| 402 | 4.150E-02 | 443 | 7.531E+00 | 484 | 6.996E+00 | 525 | 2.016E+01 | 566 | 2.888E+01 |
| 403 | 2.540E-02 | 444 | 8.308E+00 | 485 | 7.079E+00 | 526 | 2.040E+01 | 567 | 2.915E+01 |
| 404 | 4.000E-02 | 445 | 9.171E+00 | 486 | 7.224E+00 | 527 | 2.066E+01 | 568 | 2.927E+01 |
| 405 | 2.510E-02 | 446 | 1.009E+01 | 487 | 7.415E+00 | 528 | 2.109E+01 | 569 | 2.939E+01 |
| 406 | 1.260E-02 | 447 | 1.116E+01 | 488 | 7.569E+00 | 529 | 2.145E+01 | 570 | 2.959E+01 |
| 407 | 9.990E-02 | 448 | 1.220E+01 | 489 | 7.777E+00 | 530 | 2.167E+01 | 571 | 2.973E+01 |
| 408 | 1.490E-02 | 449 | 1.372E+01 | 490 | 7.970E+00 | 531 | 2.180E+01 | 572 | 2.980E+01 |
| 409 | 6.930E-02 | 450 | 1.468E+01 | 491 | 8.216E+00 | 532 | 2.209E+01 | 573 | 3.008E+01 |
| 410 | 1.192E-01 | 451 | 1.583E+01 | 492 | 8.436E+00 | 533 | 2.247E+01 | 574 | 3.003E+01 |
| 411 | 1.166E-01 | 452 | 1.665E+01 | 493 | 8.705E+00 | 534 | 2.265E+01 | 575 | 3.028E+01 |
| 412 | 1.233E-01 | 453 | 1.740E+01 | 494 | 8.994E+00 | 535 | 2.296E+01 | 576 | 3.050E+01 |
| 413 | 1.063E-01 | 454 | 1.779E+01 | 495 | 9.331E+00 | 536 | 2.309E+01 | 577 | 3.063E+01 |
| 414 | 2.213E-01 | 455 | 1.786E+01 | 496 | 9.666E+00 | 537 | 2.334E+01 | 578 | 3.087E+01 |
| 415 | 2.551E-01 | 456 | 1.747E+01 | 497 | 9.949E+00 | 538 | 2.366E+01 | 579 | 3.107E+01 |
| 416 | 2.696E-01 | 457 | 1.702E+01 | 498 | 1.033E+01 | 539 | 2.390E+01 | 580 | 3.111E+01 |
| 417 | 3.434E-01 | 458 | 1.617E+01 | 499 | 1.073E+01 | 540 | 2.406E+01 | 581 | 3.142E+01 |
| 418 | 3.974E-01 | 459 | 1.514E+01 | 500 | 1.108E+01 | 541 | 2.422E+01 | 582 | 3.169E+01 |
| 419 | 4.845E-01 | 460 | 1.439E+01 | 501 | 1.149E+01 | 542 | 2.451E+01 | 583 | 3.181E+01 |
| 420 | 5.908E-01 | 461 | 1.360E+01 | 502 | 1.193E+01 | 543 | 2.478E+01 | 584 | 3.215E+01 |

| nm | mW | nm | mW | nm | mW | nm | mW | nm | mW |
|-----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|
| 585 | 3.229E+01 | 626 | 4.419E+01 | 667 | 3.401E+01 | 708 | 1.405E+01 | 749 | 3.842E+00 |
| 586 | 3.245E+01 | 627 | 4.417E+01 | 668 | 3.367E+01 | 709 | 1.368E+01 | 750 | 3.735E+00 |
| 587 | 3.286E+01 | 628 | 4.447E+01 | 669 | 3.316E+01 | 710 | 1.325E+01 | 751 | 3.589E+00 |
| 588 | 3.311E+01 | 629 | 4.431E+01 | 670 | 3.251E+01 | 711 | 1.301E+01 | 752 | 3.544E+00 |
| 589 | 3.342E+01 | 630 | 4.426E+01 | 671 | 3.194E+01 | 712 | 1.261E+01 | 753 | 3.359E+00 |
| 590 | 3.367E+01 | 631 | 4.434E+01 | 672 | 3.150E+01 | 713 | 1.241E+01 | 754 | 3.255E+00 |
| 591 | 3.396E+01 | 632 | 4.452E+01 | 673 | 3.096E+01 | 714 | 1.204E+01 | 755 | 3.059E+00 |
| 592 | 3.438E+01 | 633 | 4.438E+01 | 674 | 3.043E+01 | 715 | 1.164E+01 | 756 | 2.953E+00 |
| 593 | 3.458E+01 | 634 | 4.433E+01 | 675 | 2.978E+01 | 716 | 1.134E+01 | 757 | 2.940E+00 |
| 594 | 3.499E+01 | 635 | 4.430E+01 | 676 | 2.932E+01 | 717 | 1.105E+01 | 758 | 2.442E+00 |
| 595 | 3.536E+01 | 636 | 4.415E+01 | 677 | 2.879E+01 | 718 | 1.070E+01 | 759 | 2.634E+00 |
| 596 | 3.581E+01 | 637 | 4.401E+01 | 678 | 2.833E+01 | 719 | 1.043E+01 | 760 | 2.461E+00 |
| 597 | 3.605E+01 | 638 | 4.395E+01 | 679 | 2.766E+01 | 720 | 1.016E+01 | 761 | 2.410E+00 |
| 598 | 3.636E+01 | 639 | 4.384E+01 | 680 | 2.712E+01 | 721 | 9.945E+00 | 762 | 2.403E+00 |
| 599 | 3.685E+01 | 640 | 4.373E+01 | 681 | 2.668E+01 | 722 | 9.585E+00 | 763 | 2.374E+00 |
| 600 | 3.719E+01 | 641 | 4.350E+01 | 682 | 2.612E+01 | 723 | 9.358E+00 | 764 | 2.210E+00 |
| 601 | 3.767E+01 | 642 | 4.352E+01 | 683 | 2.549E+01 | 724 | 8.944E+00 | 765 | 2.054E+00 |
| 602 | 3.787E+01 | 643 | 4.327E+01 | 684 | 2.506E+01 | 725 | 8.817E+00 | 766 | 1.970E+00 |
| 603 | 3.822E+01 | 644 | 4.311E+01 | 685 | 2.459E+01 | 726 | 8.482E+00 | 767 | 1.966E+00 |
| 604 | 3.876E+01 | 645 | 4.286E+01 | 686 | 2.406E+01 | 727 | 8.193E+00 | 768 | 1.882E+00 |
| 605 | 3.900E+01 | 646 | 4.259E+01 | 687 | 2.354E+01 | 728 | 8.062E+00 | 769 | 1.784E+00 |
| 606 | 3.945E+01 | 647 | 4.239E+01 | 688 | 2.296E+01 | 729 | 7.837E+00 | 770 | 1.614E+00 |
| 607 | 3.984E+01 | 648 | 4.211E+01 | 689 | 2.260E+01 | 730 | 7.547E+00 | 771 | 1.555E+00 |
| 608 | 4.010E+01 | 649 | 4.190E+01 | 690 | 2.199E+01 | 731 | 7.320E+00 | 772 | 1.670E+00 |
| 609 | 4.055E+01 | 650 | 4.154E+01 | 691 | 2.160E+01 | 732 | 7.167E+00 | 773 | 1.440E+00 |
| 610 | 4.082E+01 | 651 | 4.130E+01 | 692 | 2.101E+01 | 733 | 6.825E+00 | 774 | 1.432E+00 |
| 611 | 4.115E+01 | 652 | 4.088E+01 | 693 | 2.056E+01 | 734 | 6.557E+00 | 775 | 1.376E+00 |
| 612 | 4.142E+01 | 653 | 4.051E+01 | 694 | 2.014E+01 | 735 | 6.500E+00 | 776 | 1.285E+00 |
| 613 | 4.181E+01 | 654 | 4.009E+01 | 695 | 1.961E+01 | 736 | 6.100E+00 | 777 | 1.273E+00 |
| 614 | 4.198E+01 | 655 | 3.984E+01 | 696 | 1.904E+01 | 737 | 6.014E+00 | 778 | 1.216E+00 |
| 615 | 4.231E+01 | 656 | 3.945E+01 | 697 | 1.868E+01 | 738 | 5.662E+00 | 779 | 1.175E+00 |
| 616 | 4.249E+01 | 657 | 3.889E+01 | 698 | 1.825E+01 | 739 | 5.546E+00 | 780 | 1.091E+00 |
| 617 | 4.281E+01 | 658 | 3.857E+01 | 699 | 1.783E+01 | 740 | 5.255E+00 | | |
| 618 | 4.308E+01 | 659 | 3.802E+01 | 700 | 1.732E+01 | 741 | 5.179E+00 | | |
| 619 | 4.330E+01 | 660 | 3.767E+01 | 701 | 1.693E+01 | 742 | 5.028E+00 | | |
| 620 | 4.351E+01 | 661 | 3.727E+01 | 702 | 1.643E+01 | 743 | 4.828E+00 | | |
| 621 | 4.375E+01 | 662 | 3.674E+01 | 703 | 1.606E+01 | 744 | 4.469E+00 | | |
| 622 | 4.377E+01 | 663 | 3.632E+01 | 704 | 1.569E+01 | 745 | 4.455E+00 | | |
| 623 | 4.376E+01 | 664 | 3.579E+01 | 705 | 1.522E+01 | 746 | 4.082E+00 | | |
| 624 | 4.402E+01 | 665 | 3.512E+01 | 706 | 1.483E+01 | 747 | 4.111E+00 | | |
| 625 | 4.407E+01 | 666 | 3.460E+01 | 707 | 1.442E+01 | 748 | 4.008E+00 | | |

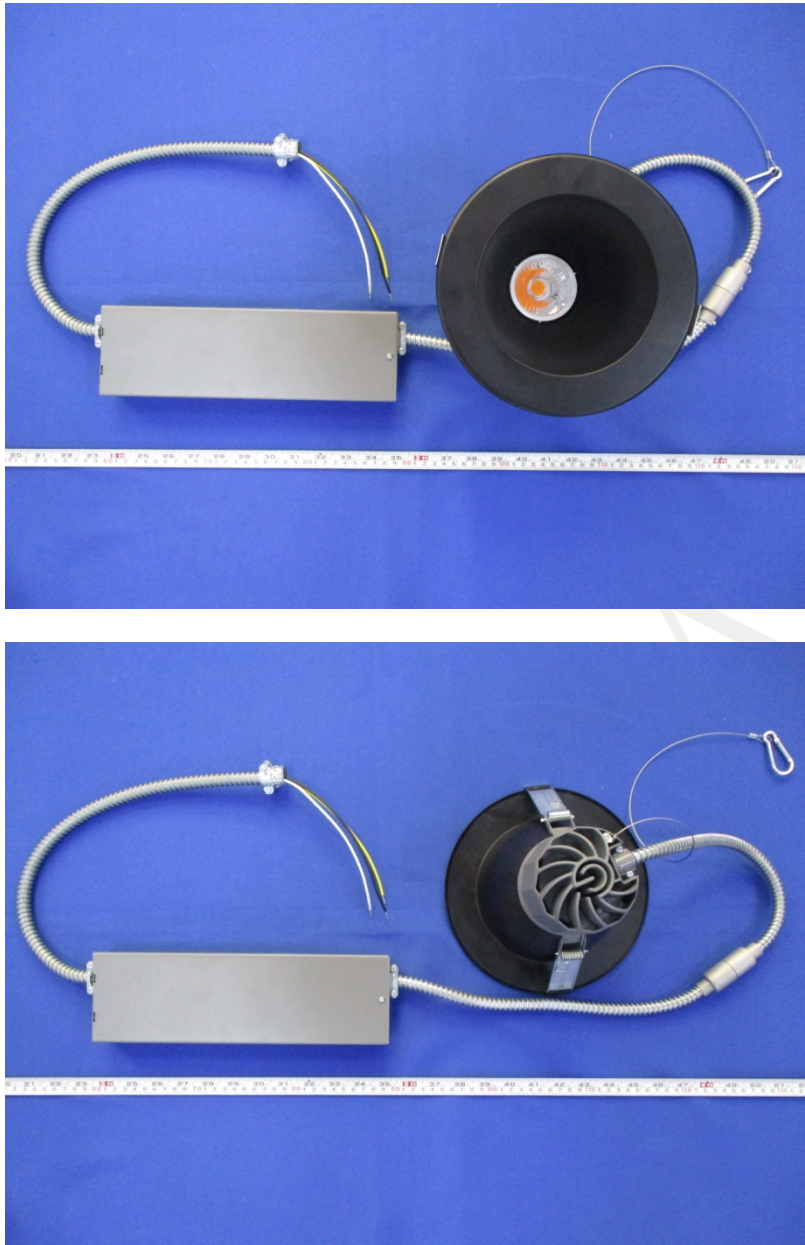
CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



6. Product Photo



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