# Test Report Of ANSI/IES LM-79-19

## APPROVED METHOD FOR OPTICAL AND ELECTRICAL MEASUREMENTS OF SOLID-STATE LIGHTING PRODUCTS

| | | |
|---|---|---|
| **Report Number**..... | : | N02A23080353L01001 |
| **Client**..... | : | IKIO LED LIGHTING |
| **Address**..... | : | 8470 Allison Pointe Blvd, Suite 128 Indianapolis, IN 46250 |
| **Test Model**..... | : | IK-HBAX-0300-50-DY-RLHV04BI |
| **Brand Name**..... | : | IKIO |
| **Address**..... | : | 1st floor, B Area, Jinbaisheng Industrial Park, Headquarters 2 Road, Songshan Lake Hi-tech Industrial Development Zone, Dongguan City, Guangdong Pr., China. |
| **Testing location**..... | : | As above |
| **Date of receipt**..... | : | Aug. 14, 2023 |
| **Date of test** ..... | : | Aug. 30, 2023 – Sep. 08, 2023 |
| **Date of report**..... | : | Sep. 08, 2023 |

| **Tested by:** | **Checked by:** | **Approved by:** |
|---|---|---|
| Jarvis Zhang/ Test Engineer | Sandy Chen/ Project Engineer | Jessie Li/ Technical Manager |

Note 1: 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 use in part without prior written consent from Guangdong Meide Testing Technology Co., Ltd. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP,NIST, or any agency of the Federal Government.
Note 2: This report does not imply product certification, approval, or endorsement by NVLAP, NIST,or any agency of the Federal Government.
Note 3: This report contains data that are not covered by the NVLAP accreditation. It is marked * in the title.

## 1. Product Description for Equipment under Test(EUT)

| | |
|---|---|
| Representative (Tested) Model: | IK-HBAX-0300-50-DY-RLHV04BI |
| Manufacturer: | IKIO LED LIGHTING |
| Product Type: | High Bay Luminaires (Commercial and Industrial) |
| Rated Voltage/Frequency: | 277-480V AC, 50/60Hz |
| Rated Power: | 300W |
| Rated luminous flux: | 42000lm |
| Nominal CCT: | 5000K |
| LED Manufacturer: | Bridgelux Inc. |
| LED Model No.: | BXEN-50E-11M-3CA |

## 2.Standards Used

- ANSI/IES LM-79-19:APPROVED METHOD:OPTICAL AND ELECTRICAL MEASUREMENTS OF SOLID-STATE LIGHTING PRODUCTS
- IES TM-30-18 IES Method for Evaluating Light Source Color Rendition (This Method is not in Nvlap accreditation scope)
- ANSI C82.77-10:2014 Harmonic Emission Limits – Related Power Quality Requirements for Lighting Equipment-Solid State

## 3.Test equipment list

| Test Equipment | Serial No. | Model No. | Calibration due date |
|---|---|---|---|
| Full-field Speed Goniophotometer | MD-E028 | GO-R5000 | 2023/09/17 |
| Digital Power Meter | MD-E001 | PF2010 | 2023/09/17 |
| AC Testing Power Source | MD-E002 | DPS1060 | 2023/09/17 |
| Total Spectral Radiant Flux Standard Lamp | MD-E007 | D908S | 2023/10/13 |
| Integrating Sphere System | MD-E029 | 2M | 2023/09/17 |
| High Accuracy Array Spectroradio Meter | MD-E011 | HAAS-3000 | 2023/09/17 |
| Digital Power Meter | MD-E008 | PF310 | 2023/09/17 |
| AC Testing Power Source | MD-E010 | DPS1010 | 2023/09/17 |
| Standard Lamp | MD-E036 | D204 | 2023/10/13 |

Statement of Traceability: Guangdong Meide Testing Technology Co., Ltd. attested that all calibration has been performed using suitable standards traceable to national primary standards and International System of Unit(SI).

## 4. Test Method

**Requirements of Ambient Condition**
Product was tested with no seasoning. All stabilization and measurements were made in compliance with ANSI/IES LM-79-19. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at 25°C±1.2°C during measurement. And relative humidity between 10% and 65%.

**Goniophotometer System**
The sample was tested according to the ANSI/IES LM-79-19.

Photometric paramters were measured using a type C goniophotometer and software. The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, Luminous efficacy, zonal flux were calculated from the software taken at 1° vertical intervals and 22.5°horizontal intervals.Photometric distance was more than five times of the Largest dimension of the test SSL product.

**Integrating Sphere System**
The sample was tested according to the ANSI/IES LM-79-19.

The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

**Fidelity Index ($R_f$) and Gamut Index ($R_g$) 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.

**THD and PF Test**

The sample was tested according to the ANSI C82.77-10:2014.

The sample was operated at rated voltage and was stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

## 5. Integrating Sphere Test Results

### 5.1 Test Data

| Test Ambient Temperature (Integrating sphere internal temperature) | 25.3℃ | Test orientation | Downward |
|---|---|---|---|
| Operate time(Min.) | 60 | stabilization time(Min.) | 30 |

**Optical and Electrical Measurement Result**

| Voltage (V) | Frequency (Hz) | Current (A) | Power (W) | Power Factor | Luminous Flux(lm) | Efficacy (lm/W) | CCT (K) |
|---|---|---|---|---|---|---|---|
| 277.02 | 60 | 1.085 | 299.9 | 0.9981 | 44144 | 147.18 | 4888 |

| Ra | R9 | Rf | Rg | x | y | u' | v' | Duv |
|---|---|---|---|---|---|---|---|---|
| 84.1 | 16 | 84 | 97 | 0.3486 | 0.3567 | 0.2118 | 0.4877 | 1.17E-03 |

### 5.2 Color Rendering Index

| Ra |
|---|
| 84.1 |

| R1 | R2 | R3 | R4 | R5 |
|---|---|---|---|---|
| 83 | 89 | 93 | 84 | 83 |

| R6 | R7 | R8 | R9 | R10 |
|---|---|---|---|---|
| 84 | 89 | 70 | 16 | 72 |

| R11 | R12 | R13 | R14 | R15 |
|---|---|---|---|---|
| 83 | 59 | 84 | 96 | 78 |

***5.3 ANSI/IES TM-30-18 Color Rendition Report**

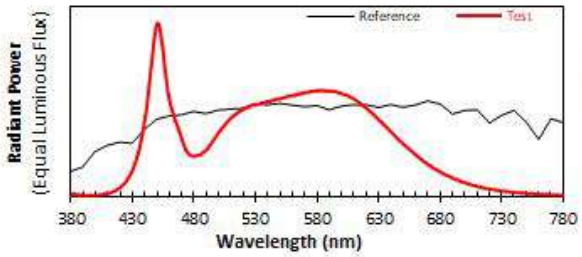
**ANSI/IES TM-30-18 Color Rendition Report**

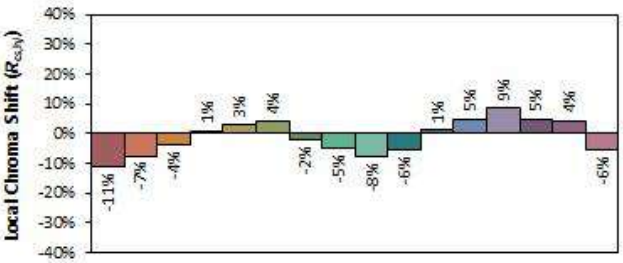
**Source:** BXEN-50E-11M-3CA

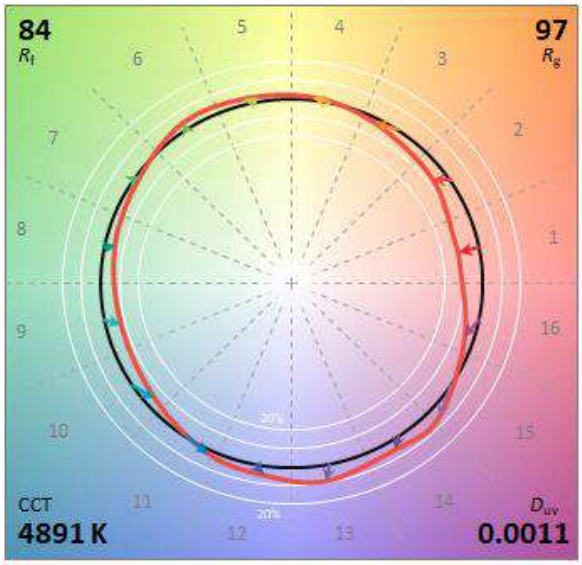
**Manufacturer:** IKIO LED LIGHTING

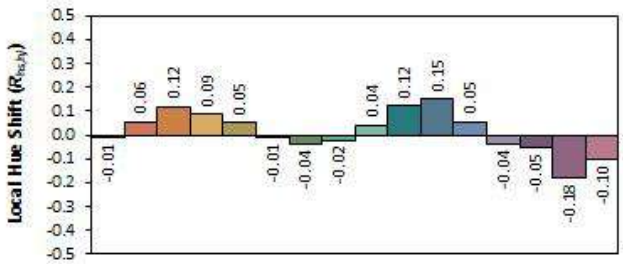
**Date:** 2023/9/7

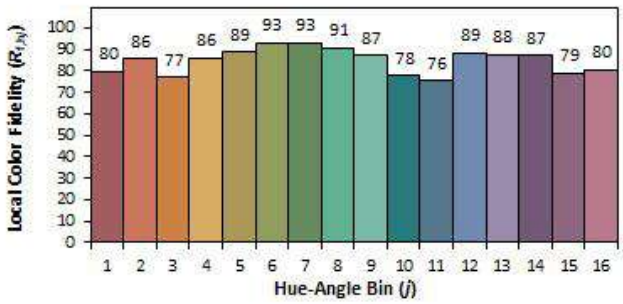
**Model:** IK-HBAX-0300-50-DY-RLHV04BI

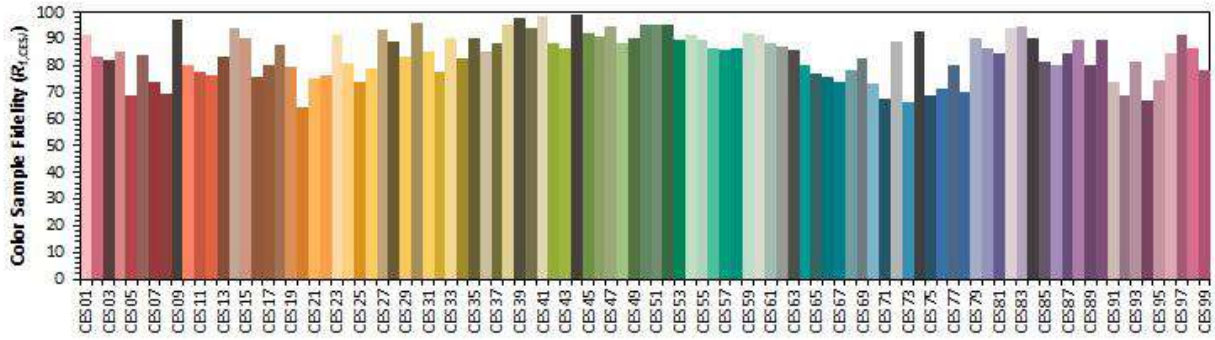



**Notes:** This is a recommended method for displaying ANSI/IES TM-30-18 information.

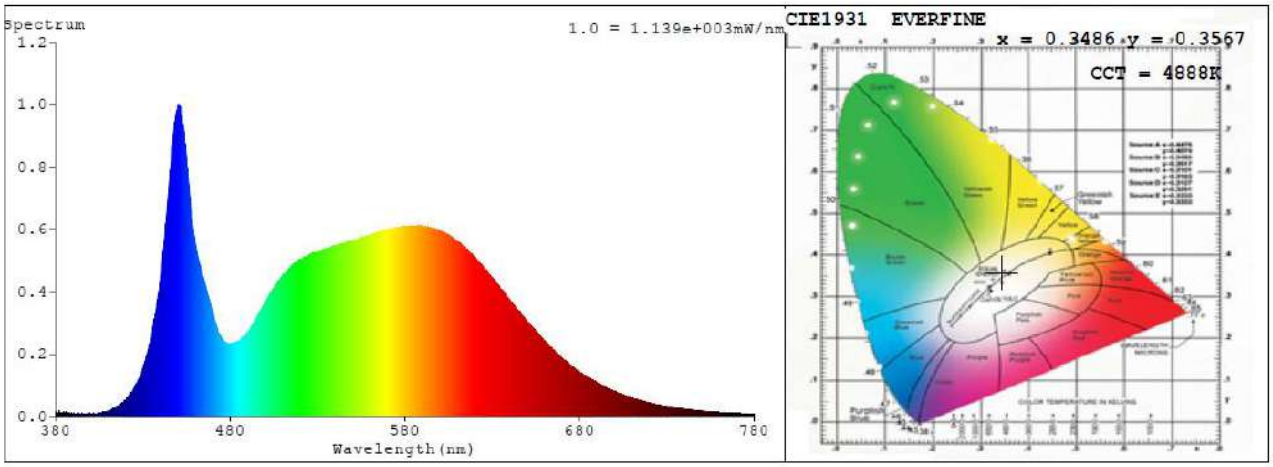
| | |
|---|---|
| $x$ | **0.3485** |
| $y$ | **0.3565** |
| $u'$ | **0.2118** |
| $v'$ | **0.4876** |

CIE 13.3-1995 (CRI)

| | |
|---|---|
| $R_a$ | 84 |
| $R_9$ | 16 |

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

### 5.4 Relative Spectral Power Distribution




| nm | mW | nm | mW | nm | mW | nm | mW | nm | mW |
|---|---|---|---|---|---|---|---|---|---|
| 380 | 0.0069 | 414 | 0.028 | 448 | 0.9264 | 482 | 0.2353 | 516 | 0.4831 |
| 381 | 0.0134 | 415 | 0.0303 | 449 | 0.9741 | 483 | 0.2352 | 517 | 0.4907 |
| 382 | 0.0184 | 416 | 0.0338 | 450 | 0.9988 | 484 | 0.2397 | 518 | 0.4953 |
| 383 | 0.0123 | 417 | 0.0378 | 451 | 0.9964 | 485 | 0.2401 | 519 | 0.497 |
| 384 | 0.0103 | 418 | 0.0443 | 452 | 0.9726 | 486 | 0.2445 | 520 | 0.5047 |
| 385 | 0.01 | 419 | 0.0476 | 453 | 0.9318 | 487 | 0.2529 | 521 | 0.5046 |
| 386 | 0.0112 | 420 | 0.0531 | 454 | 0.8756 | 488 | 0.2568 | 522 | 0.5092 |
| 387 | 0.0037 | 421 | 0.0597 | 455 | 0.8262 | 489 | 0.2608 | 523 | 0.5122 |
| 388 | 0.007 | 422 | 0.066 | 456 | 0.7567 | 490 | 0.2694 | 524 | 0.5142 |
| 389 | 0.0132 | 423 | 0.0725 | 457 | 0.6923 | 491 | 0.2755 | 525 | 0.517 |
| 390 | 0.0089 | 424 | 0.0788 | 458 | 0.6414 | 492 | 0.2854 | 526 | 0.5208 |
| 391 | 0.0071 | 425 | 0.0908 | 459 | 0.5921 | 493 | 0.2976 | 527 | 0.5254 |
| 392 | 0.0043 | 426 | 0.1018 | 460 | 0.5558 | 494 | 0.3055 | 528 | 0.5241 |
| 393 | 0.0066 | 427 | 0.1135 | 461 | 0.5258 | 495 | 0.3147 | 529 | 0.5244 |
| 394 | 0.0075 | 428 | 0.1232 | 462 | 0.4993 | 496 | 0.3268 | 530 | 0.5308 |
| 395 | 0.0067 | 429 | 0.1375 | 463 | 0.4797 | 497 | 0.3377 | 531 | 0.5309 |
| 396 | 0.0064 | 430 | 0.1538 | 464 | 0.4529 | 498 | 0.3457 | 532 | 0.5319 |
| 397 | 0.0073 | 431 | 0.1737 | 465 | 0.4309 | 499 | 0.3569 | 533 | 0.5319 |
| 398 | 0.008 | 432 | 0.1925 | 466 | 0.4174 | 500 | 0.3684 | 534 | 0.5358 |
| 399 | 0.0068 | 433 | 0.2124 | 467 | 0.395 | 501 | 0.3764 | 535 | 0.5394 |
| 400 | 0.0088 | 434 | 0.2353 | 468 | 0.3746 | 502 | 0.3864 | 536 | 0.5377 |
| 401 | 0.0067 | 435 | 0.2628 | 469 | 0.3546 | 503 | 0.3939 | 537 | 0.5373 |
| 402 | 0.0089 | 436 | 0.2917 | 470 | 0.3314 | 504 | 0.4047 | 538 | 0.5438 |
| 403 | 0.0099 | 437 | 0.3216 | 471 | 0.3105 | 505 | 0.4093 | 539 | 0.5468 |
| 404 | 0.0095 | 438 | 0.3627 | 472 | 0.2935 | 506 | 0.4202 | 540 | 0.5478 |
| 405 | 0.0123 | 439 | 0.3972 | 473 | 0.2736 | 507 | 0.4299 | 541 | 0.547 |
| 406 | 0.0115 | 440 | 0.4491 | 474 | 0.2605 | 508 | 0.4362 | 542 | 0.5494 |
| 407 | 0.0146 | 441 | 0.4894 | 475 | 0.2516 | 509 | 0.4443 | 543 | 0.5537 |
| 408 | 0.0155 | 442 | 0.5436 | 476 | 0.2438 | 510 | 0.4513 | 544 | 0.5538 |
| 409 | 0.0154 | 443 | 0.6131 | 477 | 0.2383 | 511 | 0.4574 | 545 | 0.5555 |
| 410 | 0.0165 | 444 | 0.6788 | 478 | 0.2343 | 512 | 0.4661 | 546 | 0.5576 |
| 411 | 0.0193 | 445 | 0.7417 | 479 | 0.2336 | 513 | 0.4678 | 547 | 0.5602 |
| 412 | 0.0216 | 446 | 0.7996 | 480 | 0.2314 | 514 | 0.4742 | 548 | 0.5637 |
| 413 | 0.025 | 447 | 0.8721 | 481 | 0.2327 | 515 | 0.4813 | 549 | 0.5601 |

| nm | mW | nm | mW | nm | mW | nm | mW | nm | mW |
|---|---|---|---|---|---|---|---|---|---|
| 550 | 0.5617 | 599 | 0.5959 | 648 | 0.3191 | 697 | 0.088 | 746 | 0.0203 |
| 551 | 0.5669 | 600 | 0.5929 | 649 | 0.3119 | 698 | 0.0863 | 747 | 0.0198 |
| 552 | 0.5672 | 601 | 0.5916 | 650 | 0.3057 | 699 | 0.0825 | 748 | 0.0192 |
| 553 | 0.569 | 602 | 0.5878 | 651 | 0.2982 | 700 | 0.0804 | 749 | 0.0191 |
| 554 | 0.5715 | 603 | 0.586 | 652 | 0.2942 | 701 | 0.0783 | 750 | 0.0181 |
| 555 | 0.574 | 604 | 0.5831 | 653 | 0.2847 | 702 | 0.076 | 751 | 0.0177 |
| 556 | 0.5756 | 605 | 0.5813 | 654 | 0.2807 | 703 | 0.0737 | 752 | 0.0171 |
| 557 | 0.5783 | 606 | 0.5785 | 655 | 0.274 | 704 | 0.0716 | 753 | 0.0168 |
| 558 | 0.5792 | 607 | 0.5735 | 656 | 0.2676 | 705 | 0.0691 | 754 | 0.0161 |
| 559 | 0.5804 | 608 | 0.57 | 657 | 0.2617 | 706 | 0.0667 | 755 | 0.0161 |
| 560 | 0.5814 | 609 | 0.5682 | 658 | 0.2569 | 707 | 0.0657 | 756 | 0.0158 |
| 561 | 0.5831 | 610 | 0.5632 | 659 | 0.2487 | 708 | 0.0628 | 757 | 0.0151 |
| 562 | 0.5799 | 611 | 0.5567 | 660 | 0.2416 | 709 | 0.0625 | 758 | 0.014 |
| 563 | 0.586 | 612 | 0.5541 | 661 | 0.2395 | 710 | 0.0595 | 759 | 0.0143 |
| 564 | 0.5922 | 613 | 0.549 | 662 | 0.2317 | 711 | 0.0578 | 760 | 0.014 |
| 565 | 0.5875 | 614 | 0.5437 | 663 | 0.2242 | 712 | 0.0558 | 761 | 0.0133 |
| 566 | 0.5914 | 615 | 0.5387 | 664 | 0.2198 | 713 | 0.0549 | 762 | 0.0131 |
| 567 | 0.5958 | 616 | 0.5315 | 665 | 0.2132 | 714 | 0.0529 | 763 | 0.013 |
| 568 | 0.5938 | 617 | 0.5257 | 666 | 0.2083 | 715 | 0.0506 | 764 | 0.0126 |
| 569 | 0.5963 | 618 | 0.5199 | 667 | 0.2035 | 716 | 0.05 | 765 | 0.012 |
| 570 | 0.5982 | 619 | 0.5165 | 668 | 0.197 | 717 | 0.048 | 766 | 0.012 |
| 571 | 0.5997 | 620 | 0.5109 | 669 | 0.1927 | 718 | 0.0462 | 767 | 0.0116 |
| 572 | 0.6009 | 621 | 0.5043 | 670 | 0.1878 | 719 | 0.0454 | 768 | 0.0113 |
| 573 | 0.6005 | 622 | 0.4975 | 671 | 0.1813 | 720 | 0.0447 | 769 | 0.0111 |
| 574 | 0.5992 | 623 | 0.4919 | 672 | 0.1788 | 721 | 0.0433 | 770 | 0.0104 |
| 575 | 0.6063 | 624 | 0.4853 | 673 | 0.1739 | 722 | 0.0416 | 771 | 0.0099 |
| 576 | 0.605 | 625 | 0.4816 | 674 | 0.1677 | 723 | 0.0401 | 772 | 0.0099 |
| 577 | 0.6071 | 626 | 0.4732 | 675 | 0.1629 | 724 | 0.0391 | 773 | 0.01 |
| 578 | 0.6094 | 627 | 0.4655 | 676 | 0.1595 | 725 | 0.0386 | 774 | 0.0097 |
| 579 | 0.6065 | 628 | 0.4584 | 677 | 0.1552 | 726 | 0.0367 | 775 | 0.0092 |
| 580 | 0.6107 | 629 | 0.4526 | 678 | 0.1514 | 727 | 0.0351 | 776 | 0.009 |
| 581 | 0.6085 | 630 | 0.4446 | 679 | 0.1482 | 728 | 0.0346 | 777 | 0.0092 |
| 582 | 0.612 | 631 | 0.4386 | 680 | 0.1447 | 729 | 0.0331 | 778 | 0.0084 |
| 583 | 0.6093 | 632 | 0.4303 | 681 | 0.1396 | 730 | 0.0326 | 779 | 0.0089 |
| 584 | 0.6111 | 633 | 0.4272 | 682 | 0.1353 | 731 | 0.0308 | 780 | 0.009 |
| 585 | 0.612 | 634 | 0.4178 | 683 | 0.1312 | 732 | 0.0308 | | |
| 586 | 0.6083 | 635 | 0.4086 | 684 | 0.1277 | 733 | 0.0297 | | |
| 587 | 0.6097 | 636 | 0.4046 | 685 | 0.1257 | 734 | 0.0287 | | |
| 588 | 0.6093 | 637 | 0.3973 | 686 | 0.1211 | 735 | 0.0276 | | |
| 589 | 0.606 | 638 | 0.3893 | 687 | 0.119 | 736 | 0.0275 | | |
| 590 | 0.6084 | 639 | 0.3821 | 688 | 0.1159 | 737 | 0.0262 | | |
| 591 | 0.6078 | 640 | 0.374 | 689 | 0.1126 | 738 | 0.0251 | | |
| 592 | 0.6069 | 641 | 0.3676 | 690 | 0.1085 | 739 | 0.0256 | | |
| 593 | 0.6062 | 642 | 0.3622 | 691 | 0.1056 | 740 | 0.0239 | | |
| 594 | 0.6062 | 643 | 0.3527 | 692 | 0.1026 | 741 | 0.0234 | | |
| 595 | 0.6042 | 644 | 0.3475 | 693 | 0.0998 | 742 | 0.0227 | | |
| 596 | 0.6038 | 645 | 0.3377 | 694 | 0.0968 | 743 | 0.0218 | | |
| 597 | 0.6008 | 646 | 0.3323 | 695 | 0.0942 | 744 | 0.0212 | | |
| 598 | 0.595 | 647 | 0.3244 | 696 | 0.0897 | 745 | 0.0204 | | |

# 6. Goniophotometer Test results

## 6.1 Test Data

| Test Ambient Temperature | 25.2℃ | Test orientation | Downward |
|---|---|---|---|
| Operate time(Min.) | 90 | stabilization time(Min.) | 30 |

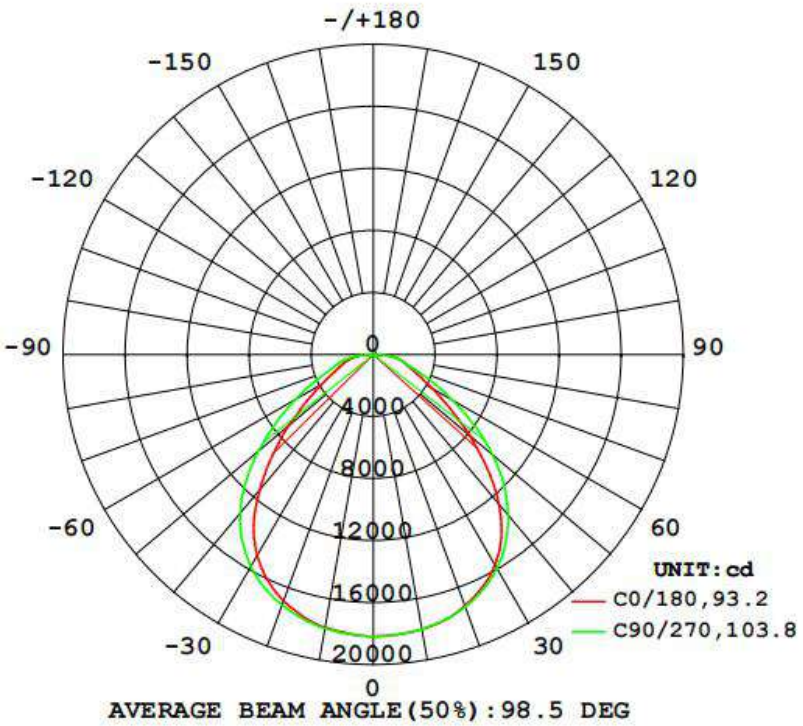
**Electrical Measurement**

| Input Voltage (V) | Frequency (Hz) | Input Current(A) | Power Factor | Power(W) |
|---|---|---|---|---|
| 277 | 60 | 1.0844 | 0.9986 | 299.9 |

**Optical Measurement**

| Luminous Flux (lm) | Efficacy(lm/W) | Imax (cd) | ZL (20-50°) |
|---|---|---|---|
| 44101.2 | 147.04 | 18165 | 56.3% |

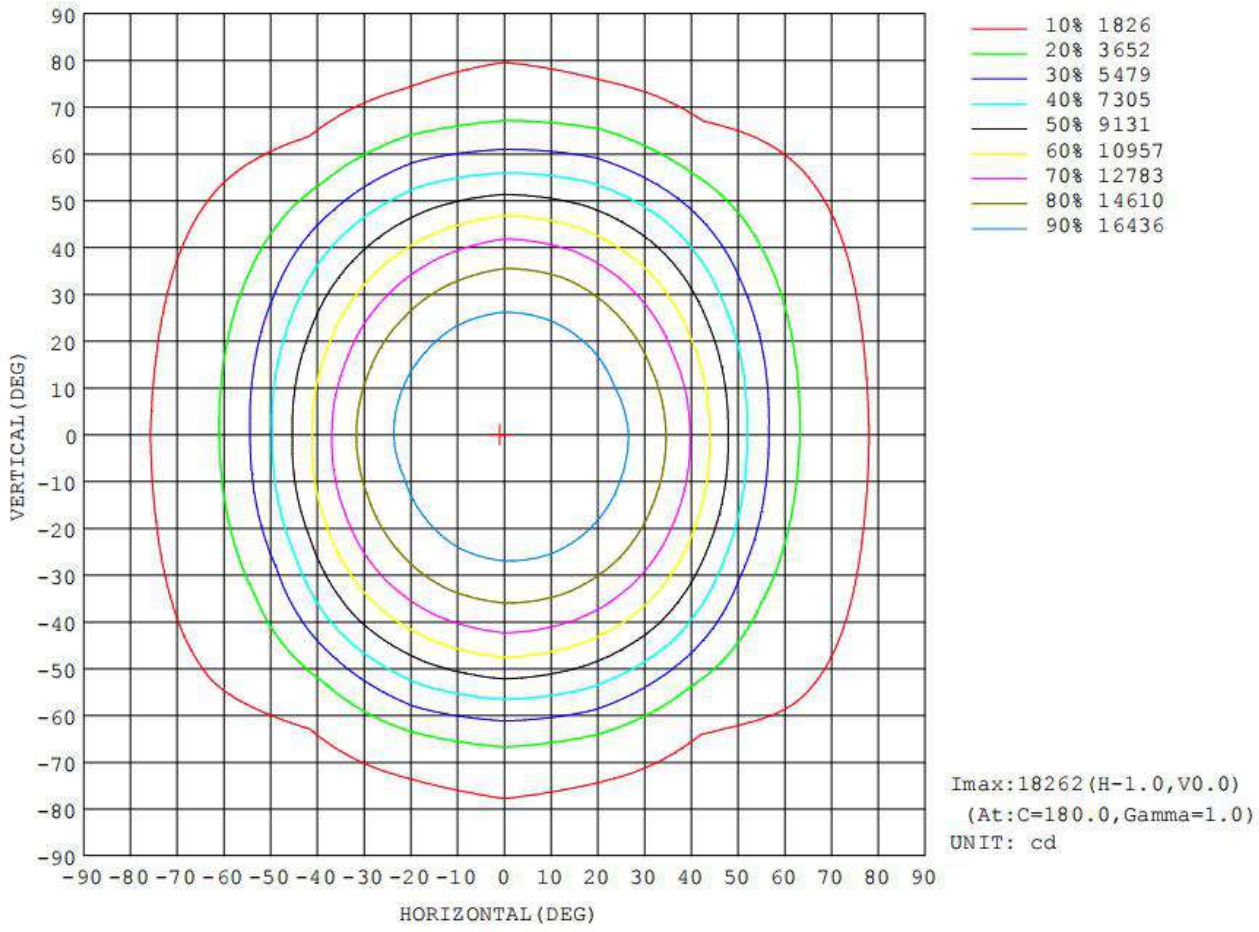
## 6.2 Luminous Intensity Distribution



### 6.3 Zonal Flux Diagram

| γ | C0 | C45 | C90 | C135 | C180 | C225 | C270 | C315 | γ | Φ zone | Φ total | %lum,lamp |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1799 | 1799 | 1797 | 1789 | 1788 | 1785 | 1793 | 1798 | 0- 10 | 1722 | 1722 | 3.91,3.91 |
| 20 | 1724 | 1736 | 1733 | 1711 | 1692 | 1702 | 1719 | 1730 | 10- 20 | 4982 | 6704 | 15.2,15.2 |
| 30 | 1568 | 1583 | 1594 | 1542 | 1498 | 1523 | 1579 | 1575 | 20- 30 | 7599 | 14303 | 32.4,32.4 |
| 40 | 1262 | 1315 | 1354 | 1252 | 1140 | 1202 | 1337 | 1296 | 30- 40 | 8924 | 23227 | 52.7,52.7 |
| 50 | 811.6 | 926.0 | 1005 | 858.9 | 710.6 | 831.0 | 966.2 | 914.3 | 40- 50 | 8286 | 31513 | 71.5,71.5 |
| 60 | 440.4 | 485.2 | 594.4 | 434.1 | 385.2 | 451.4 | 579.5 | 527.9 | 50- 60 | 6039 | 37552 | 85.1,85.1 |
| 70 | 255.5 | 196.6 | 288.3 | 184.4 | 229.5 | 191.7 | 304.5 | 231.2 | 60- 70 | 3451 | 41003 | 93,93 |
| 80 | 161.8 | 136.3 | 158.5 | 127.4 | 141.0 | 113.5 | 176.3 | 131.5 | 70- 80 | 1956 | 42958 | 97.4,97.4 |
| 90 | 4.253 | 0.2295 | 10.73 | 4.150 | 0.3173 | 0.2573 | 14.61 | 4.752 | 80- 90 | 828.5 | 43787 | 99.3,99.3 |
| 100 | 8.439 | 4.912 | 0.8526 | 4.774 | 8.152 | 4.751 | 0.9486 | 4.945 | 90-100 | 26.90 | 43814 | 99.3,99.3 |
| 110 | 8.174 | 6.209 | 2.007 | 5.154 | 7.704 | 5.553 | 2.084 | 6.089 | 100-110 | 53.23 | 43867 | 99.5,99.5 |
| 120 | 9.118 | 6.573 | 2.697 | 5.622 | 8.379 | 5.793 | 2.723 | 6.694 | 110-120 | 57.37 | 43924 | 99.6,99.6 |
| 130 | 8.768 | 6.958 | 3.314 | 6.046 | 7.702 | 6.308 | 3.173 | 6.957 | 120-130 | 55.02 | 43979 | 99.7,99.7 |
| 140 | 8.332 | 6.460 | 3.754 | 5.902 | 7.728 | 6.312 | 3.753 | 6.609 | 130-140 | 48.21 | 44028 | 99.8,99.8 |
| 150 | 7.244 | 6.124 | 3.964 | 5.486 | 7.181 | 6.302 | 4.196 | 6.337 | 140-150 | 36.75 | 44064 | 99.9,99.9 |
| 160 | 5.809 | 4.195 | 3.232 | 3.331 | 5.811 | 5.011 | 4.139 | 4.324 | 150-160 | 23.45 | 44088 | 100,100 |
| 170 | 3.519 | 2.231 | 3.011 | 3.296 | 3.153 | 3.163 | 3.503 | 3.478 | 160-170 | 10.31 | 44098 | 100,100 |
| 180 | 3.782 | 3.495 | 3.550 | 3.498 | 3.692 | 3.334 | 3.465 | 3.501 | 170-180 | 3.068 | 44101 | 100,100 |
| DEG | LUMINOUS INTENSITY:X10cd | | | | | | | | | UNIT:lm | | |

**6.4 Isocandela Diagram**



### 6.5 Luminous Distribution Intensity Data

Table--1 UNIT: X10cd

| γ (DEG) \ C(DEG) | 0 | 22.5 | 45 | 67.5 | 90 | 112.5 | 135 | 157.5 | 180 | 202.5 | 225 | 247.5 | 270 | 292.5 | 315 | 337.5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1816 | 1816 | 1816 | 1816 | 1816 | 1816 | 1816 | 1816 | 1816 | 1816 | 1816 | 1816 | 1816 | 1816 | 1816 | 1816 | | | |
| 5 | 1812 | 1812 | 1812 | 1812 | 1812 | 1812 | 1809 | 1807 | 1806 | 1805 | 1807 | 1808 | 1809 | 1809 | 1811 | 1812 | | | |
| 10 | 1799 | 1800 | 1799 | 1798 | 1797 | 1792 | 1789 | 1789 | 1788 | 1786 | 1785 | 1789 | 1793 | 1795 | 1798 | 1799 | | | |
| 15 | 1775 | 1776 | 1775 | 1773 | 1772 | 1764 | 1763 | 1753 | 1749 | 1750 | 1755 | 1757 | 1763 | 1766 | 1770 | 1775 | | | |
| 20 | 1724 | 1730 | 1736 | 1733 | 1733 | 1724 | 1711 | 1699 | 1692 | 1693 | 1702 | 1711 | 1719 | 1721 | 1730 | 1727 | | | |
| 25 | 1660 | 1663 | 1672 | 1676 | 1674 | 1663 | 1640 | 1620 | 1609 | 1615 | 1627 | 1648 | 1661 | 1663 | 1664 | 1659 | | | |
| 30 | 1568 | 1575 | 1583 | 1597 | 1594 | 1576 | 1542 | 1514 | 1498 | 1501 | 1523 | 1555 | 1579 | 1585 | 1575 | 1573 | | | |
| 35 | 1441 | 1450 | 1471 | 1487 | 1488 | 1461 | 1416 | 1372 | 1345 | 1345 | 1379 | 1430 | 1473 | 1477 | 1457 | 1443 | | | |
| 40 | 1262 | 1282 | 1315 | 1345 | 1354 | 1312 | 1252 | 1185 | 1140 | 1151 | 1202 | 1271 | 1337 | 1331 | 1296 | 1266 | | | |
| 45 | 1041 | 1074 | 1129 | 1171 | 1193 | 1136 | 1062 | 967 | 923 | 953 | 1015 | 1091 | 1165 | 1153 | 1108 | 1063 | | | |
| 50 | 812 | 844 | 926 | 977 | 1005 | 943 | 859 | 741 | 711 | 754 | 831 | 910 | 966 | 957 | 914 | 853 | | | |
| 55 | 602 | 615 | 709 | 776 | 798 | 747 | 642 | 535 | 524 | 562 | 640 | 733 | 764 | 768 | 721 | 649 | | | |
| 60 | 440 | 429 | 485 | 578 | 594 | 553 | 434 | 379 | 385 | 403 | 451 | 554 | 580 | 587 | 528 | 473 | | | |
| 65 | 328 | 302 | 307 | 389 | 419 | 372 | 278 | 272 | 289 | 286 | 296 | 384 | 420 | 422 | 354 | 339 | | | |
| 70 | 256 | 226 | 197 | 254 | 288 | 245 | 184 | 211 | 229 | 214 | 192 | 258 | 304 | 291 | 231 | 252 | | | |
| 75 | 209 | 187 | 157 | 184 | 212 | 177 | 150 | 174 | 188 | 165 | 147 | 182 | 238 | 202 | 167 | 192 | | | |
| 80 | 162 | 149 | 136 | 136 | 158 | 127 | 127 | 135 | 141 | 123 | 113 | 127 | 176 | 142 | 131 | 143 | | | |
| 85 | 106 | 98.6 | 82.6 | 83.4 | 83.7 | 75.0 | 70.9 | 79.4 | 85.2 | 74.4 | 62.4 | 76.1 | 94.9 | 86.1 | 78.2 | 95.2 | | | |
| 90 | 4.25 | 0.21 | 0.23 | 9.71 | 10.7 | 4.33 | 4.15 | 0.21 | 0.32 | 0.30 | 0.26 | 5.29 | 14.6 | 8.49 | 4.75 | 3.98 | | | |
| 95 | 0.26 | 0.27 | 0.29 | 1.61 | 0.38 | 1.71 | 3.18 | 2.82 | 0.57 | 2.99 | 4.75 | 1.76 | 0.48 | 1.62 | 2.25 | 0.36 | | | |
| 100 | 8.44 | 7.87 | 4.91 | 2.30 | 0.85 | 2.27 | 4.77 | 7.04 | 8.15 | 7.19 | 4.75 | 2.34 | 0.95 | 2.44 | 4.95 | 7.96 | | | |
| 105 | 7.98 | 7.52 | 5.73 | 2.82 | 1.43 | 2.53 | 4.88 | 7.00 | 7.45 | 7.13 | 5.11 | 2.62 | 1.52 | 2.96 | 5.44 | 7.83 | | | |
| 110 | 8.17 | 7.91 | 6.21 | 3.39 | 2.01 | 2.83 | 5.15 | 7.25 | 7.70 | 7.41 | 5.55 | 3.04 | 2.08 | 3.46 | 6.09 | 8.15 | | | |
| 115 | 8.81 | 8.44 | 6.24 | 3.84 | 2.42 | 3.38 | 5.47 | 7.72 | 8.16 | 7.82 | 5.85 | 3.61 | 2.39 | 3.90 | 6.49 | 8.66 | | | |
| 120 | 9.12 | 8.62 | 6.57 | 4.23 | 2.70 | 3.64 | 5.62 | 7.91 | 8.38 | 7.96 | 5.79 | 3.85 | 2.72 | 4.35 | 6.69 | 8.79 | | | |
| 125 | 8.97 | 8.48 | 6.83 | 4.39 | 2.80 | 4.01 | 5.71 | 7.67 | 8.13 | 7.64 | 5.92 | 4.06 | 3.01 | 4.55 | 6.77 | 8.69 | | | |
| 130 | 8.77 | 8.38 | 6.96 | 5.03 | 3.31 | 4.45 | 6.05 | 7.32 | 7.70 | 7.41 | 6.31 | 4.25 | 3.17 | 4.89 | 6.96 | 8.57 | | | |
| 135 | 8.58 | 8.19 | 6.95 | 5.30 | 3.69 | 4.57 | 5.64 | 7.34 | 7.61 | 7.55 | 5.99 | 4.41 | 3.31 | 5.13 | 7.09 | 8.41 | | | |
| 140 | 8.33 | 7.98 | 6.46 | 5.12 | 3.75 | 4.55 | 5.90 | 6.82 | 7.73 | 7.55 | 6.31 | 4.58 | 3.75 | 5.06 | 6.61 | 8.27 | | | |
| 145 | 7.81 | 7.35 | 6.43 | 4.75 | 3.69 | 3.17 | 5.95 | 6.77 | 7.06 | 6.82 | 6.38 | 3.98 | 4.05 | 4.33 | 6.69 | 7.71 | | | |
| 150 | 7.24 | 6.91 | 6.12 | 4.13 | 3.96 | 2.49 | 5.49 | 6.41 | 7.18 | 7.13 | 6.30 | 4.32 | 4.20 | 2.79 | 6.34 | 7.38 | | | |
| 155 | 6.56 | 6.31 | 5.46 | 3.72 | 3.56 | 2.56 | 4.92 | 5.73 | 6.70 | 6.62 | 5.97 | 3.08 | 4.16 | 2.70 | 5.52 | 6.72 | | | |
| 160 | 5.81 | 5.36 | 4.19 | 2.14 | 3.23 | 3.74 | 3.33 | 4.91 | 5.81 | 5.72 | 5.01 | 3.13 | 4.14 | 3.90 | 4.32 | 5.72 | | | |
| 165 | 4.27 | 3.98 | 3.52 | 2.20 | 2.91 | 3.53 | 2.60 | 2.64 | 4.51 | 4.42 | 3.15 | 3.15 | 3.90 | 3.41 | 2.62 | 4.33 | | | |
| 170 | 3.52 | 2.06 | 2.23 | 3.09 | 3.01 | 3.33 | 3.30 | 2.77 | 3.15 | 3.16 | 3.16 | 3.77 | 3.50 | 3.20 | 3.48 | 2.67 | | | |
| 175 | 3.11 | 3.32 | 3.04 | 3.07 | 3.10 | 3.21 | 3.24 | 3.37 | 3.39 | 3.40 | 3.61 | 3.50 | 3.35 | 3.26 | 3.35 | 3.38 | | | |
| 180 | 3.78 | 3.40 | 3.50 | 3.48 | 3.55 | 3.49 | 3.50 | 3.32 | 3.69 | 3.73 | 3.33 | 3.47 | 3.46 | 3.51 | 3.50 | 3.54 | | | |

## 7. THD and PF Test

| Model Number | Voltage (V AC) | Frequency (Hz) | Power Factor | THD (%) |
|---|---|---|---|---|
| IK-HBAX-0300-50-DY-RLHV04BI | 277.0 | 60 | 0.998 | 4.84 |
| | 480.0 | 60 | 0.971 | 7.92 |

## 8. Photo of sample

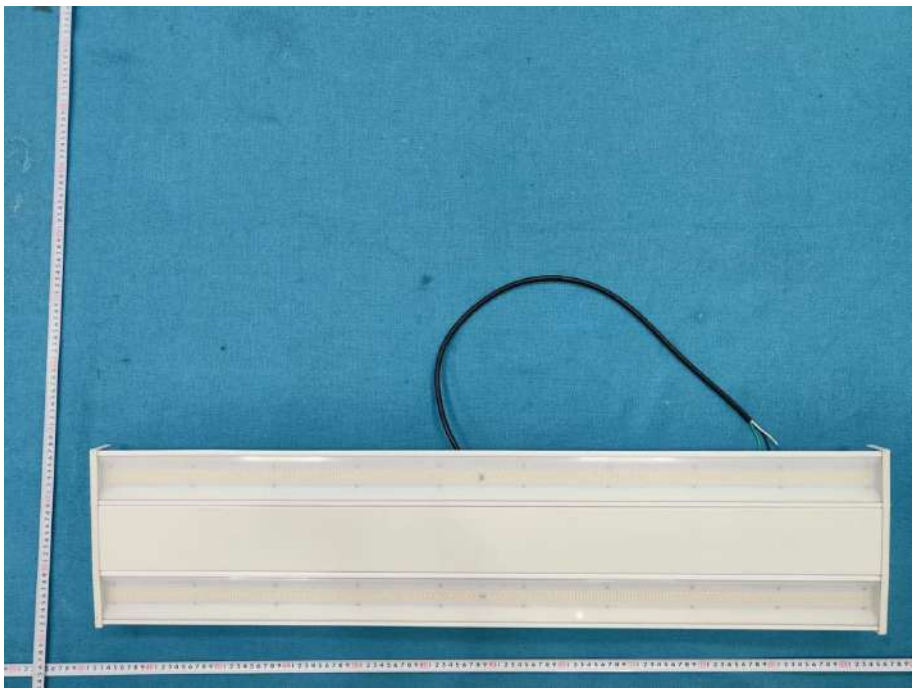


Figure 1

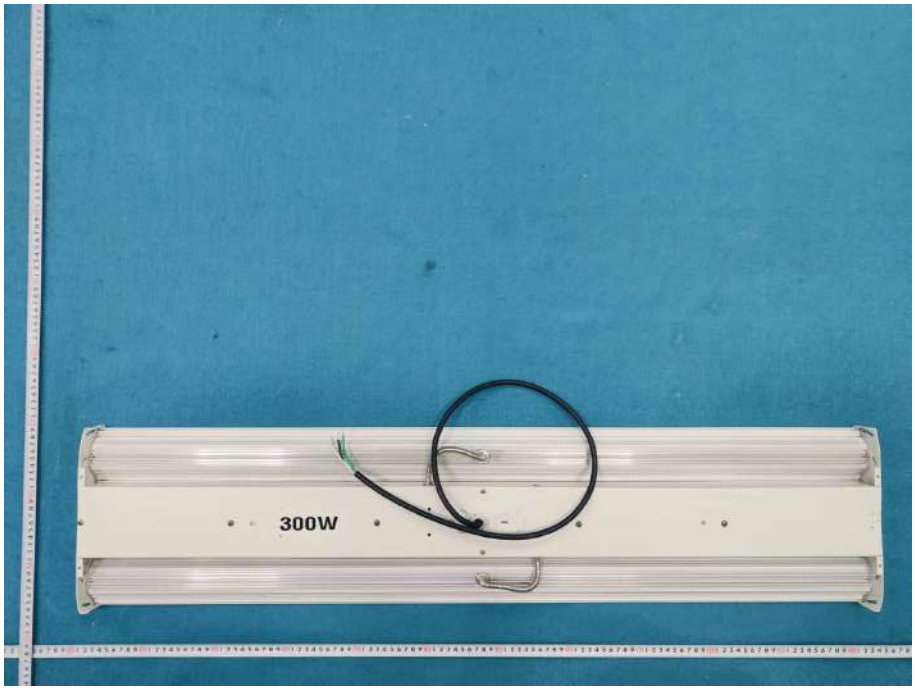



Figure 2

---End of Report---