astro

# PHOTOMETRIC TEST REPORT

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| | |
|---|---|
| **Report Number** | TRN-18320 |
| **Customer** | Astro Lighting Limited |
| **Contact** | Stuart Wells |
| **Product Type** | LED Downlight |
| **Test Purpose** | Generation of Photometric Data |
| **Sales Order Ref** | Q-LUX16-21059 |
| **Works Order Number** | WO-8967 |
| **Test Item Reference** | TI-12888 |
| **LAB Test Method Reference** | TES-10050 |
| **Test Standards** | LM-79-08 |
| **Lab Location Reference** | LUX-TSI |
| **Tested by** | Mike Sewell |
| **Date of Test** | 16-12-16 |
| **Reviewed by** | Menno Schakel |
| **Number of products tested** | 1 |

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Authorised by: Gareth Jones
Email: gjones@lux-tsi.com
Signed:
Date: 16-12-16


Dakota 300 LED 7934

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## Nomenclature

Lamp Orientation described below relates to the position in which a lamp is designed to operate for maximum performance and safety, these include:
BD - Base Down (bulb is vertically positioned with the metal base at the bottom, glass up)
BU - Base Up (bulb is vertically positioned with the metal base at the top, glass hanging down)
HBD - Horizontal +15º to Base Down
H45 - Horizontal to -45º only
VBU - Vertical Base Up ±15º
VBD - Vertical Base Down ±15º
HBU - Base Up +/- 90º (bulb can be operated in a base up or horizontal position)
HOR - Horizontal Burn (bulb is positioned with the metal base parallel to the ground)
H75 - Horizontal +/- 75º (bulb should not be operated within 15º of vertical)
U - Universal Burn (burn can be operated in any position)

## Test Conditions

Measurements were made with an ambient temperature of 25℃ +/- 1℃. Measurements were taken only after sufficient time for thermal stabilisation has been allowed. Thermal stabilisation according to LM-79-08 was achieved before measurements are measured and reported.

## Calibrations

The far field Type C Goniophotometer is calibrated using an intensity lamp calibrated by a NVLAP accredited calibration laboratory.

## Test Equipment

UL LSI Custom Far-Field Type C Moving Mirror Goniophotometer measures intensity as a function of angle. On-axis spectral measurements taken using spectrometer, for which these measurements and outputs are not accredited.

## Data Formats

IES (15 deg azimuth and 2.5 deg inclination) and LDT (15 deg C planes and 2.5 deg gamma angles)

Spectral Data file from which the calculation of chromaticity and CRI etc. have been performed and the derived results from the LightMtrX software are provided as a text file format.

All photometric data for LED products will be provided in ABSOLUTE photometric format and all non-LED data will be in relative photometric format with lamp lumens measured separately, where possible, for LOR estimation.

LUX-TSI Ltd., Pencoed Technology Park,
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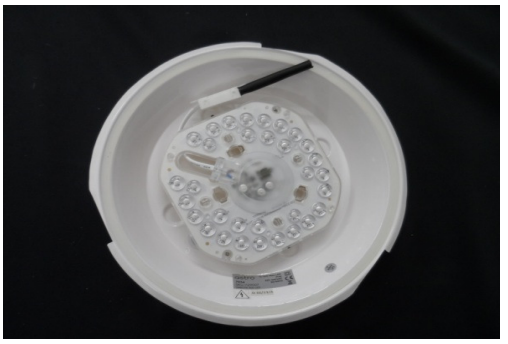
Website: www.lux-tsi.com
E-mail: info@lux-tsi.com

Test Report Number: TRN-18320
Test Item: TI-12888

| | |
|---|---|
| **Product Name** | Dakota 300 LED 7934 |
| **Part/Serial Number** | N/A |
| **Type of Product** | LED Downlight |
| **Base Type** | Not Applicable - Luminaire |
| **Driver Type** | Mains |
| **Test Time** | 30 mins |
| **Operating Orientation** | Base Up |
| **Test Orientation** | Base Up |
| **Ambient Temperature** | 25.4℃ |
| **Manufacturer** | Astro Lighting Limited |
| **Date of Manufacture** | Not Available |
| **Thermal Management** | Passive |
| **Dimmable** | No |
| **Pre-Burning Time** | 0 hours |
| **Stabilisation Time** | 60 mins |
| **Humidity** | 39.6% RH |
| **Averaging Applied** | NONE |



| **Driver Details** | | |
|---|---|---|
| Manufacturer | | N/A |
| Model | | N/A |
| Part/Serial # | | N/A |
| Rated Voltage | | N/A |
| Output | Current | N/A |
| | Voltage | N/A |

| **Photometric Measurements** | |
|---|---|
| Luminous Flux | 748 lm |
| Luminous Efficacy | 46 lm/W |

| **Dimension** | **Sample** | **Luminous Opening** |
|---|---|---|
| Diameter/Width | 300 mm Φ | 250 mm Φ |
| Length | | |
| Height/Depth | 85 mm | 25 mm |

| **Electrical Measurements** | |
|---|---|
| Frequency | 50 Hz |
| Voltage | 229.830 V |
| Current | 0.117 A |
| Power | 16.1 W |
| Power Factor | 0.597 |
| Apparent Power | 26.9 VA |

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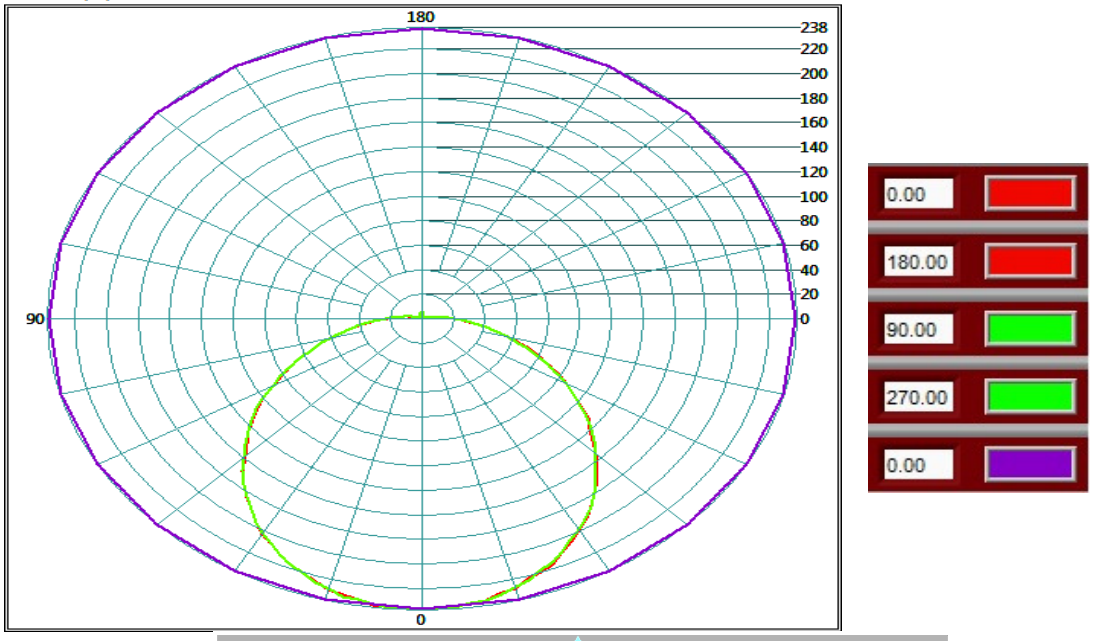
| Goniophotometric Measurements | | |
|---|---|---|
| Beam Angle | Horizontal | 114º |
| | Vertical | 114º |
| On-axis Intensity | | 237 cd |
| Peak Intensity | | 238 cd |
| Peak Direction | Horizontal | 120º |
| | Vertical | 3º |

Polar Plot (cd)



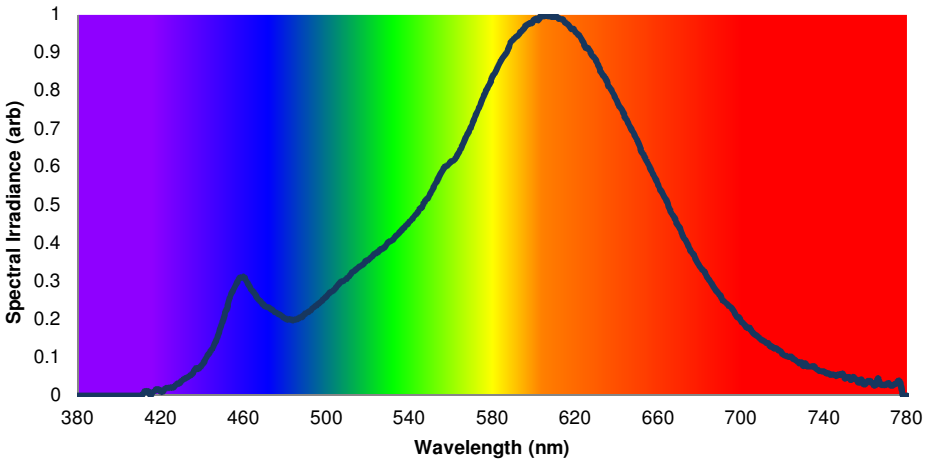

| Mounting Height (m) | Beam Cone Width (m) | Orthogonal Beam Cone Width (m) | Projected Illuminance (lux) |
|---|---|---|---|
| 0.5 | 1.54 | 1.53 | 948.8 |
| 1 | 3.08 | 3.06 | 237.2 |
| 2 | 6.16 | 6.12 | 59.3 |
| 3 | 9.23 | 9.19 | 26.4 |
| 4 | 12.31 | 12.25 | 14.8 |
| 5 | 15.39 | 15.31 | 9.5 |
| 6 | 18.47 | 18.37 | 6.6 |
| 8 | 24.63 | 24.49 | 3.7 |
| 10 | 30.78 | 30.62 | 2.4 |
| 20 | 61.57 | 61.24 | 0.6 |

**Appendix**

**On-axis Spectral Measurement**

The following data was determined from an on-axis spectral measurement using a SP1000 spectrometer at a distance of 500mm, for which these measurements and outputs are not accredited.

**Spectral Irradiance versus Wavelength**



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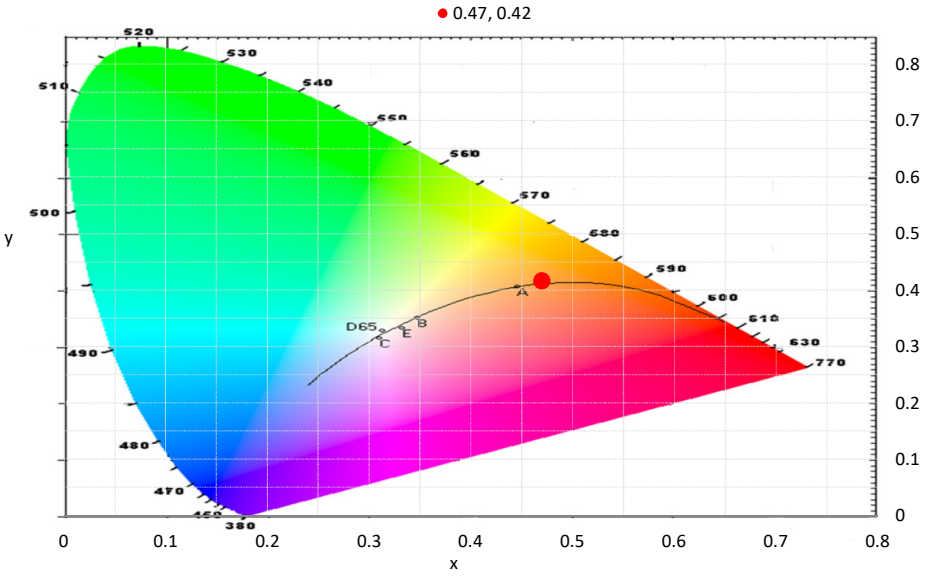
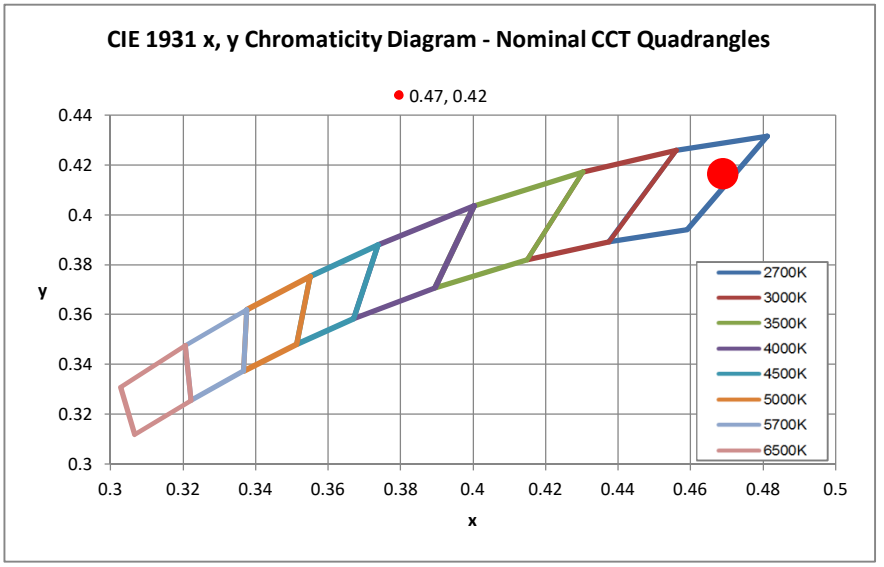
| Colour Rendering Index Detail | | | |
|---|---|---|---|
| R1 | 80 | R8 | 56 |
| R2 | 93 | R9 | 8 |
| R3 | 93 | R10 | 84 |
| R4 | 77 | R11 | 76 |
| R5 | 80 | R12 | 76 |
| R6 | 92 | R13 | 83 |
| R7 | 81 | R14 | 97 |

| Colorimetric Details | |
|---|---|
| CCT | 2618K |
| CRI (Ra) | 82 |

| Chromaticity Coordinates | | |
|---|---|---|
| CIE 1931 | x | 0.4690 |
| | y | 0.4163 |
| CIE 1960 | u | 0.2658 |
| | v | 0.3539 |
| CIE 1976 | u' | 0.2658 |
| | v' | 0.5309 |
| Duv | | 0.0013 |

**CIE 1931 Colour Chart**



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| Spectral Power Distribution | | | | | | | |
|---|---|---|---|---|---|---|---|
| λ (nm) | Arb units | λ (nm) | Arb units | λ (nm) | Arb units | λ (nm) | Arb units |
| 380 | 0.000000 | 430 | 3.86E-02 | 480 | 2.02E-01 | 530 | 4.04E-01 |
| 381 | 0.00E+00 | 431 | 4.24E-02 | 481 | 1.99E-01 | 531 | 4.06E-01 |
| 382 | 0.00E+00 | 432 | 4.50E-02 | 482 | 2.00E-01 | 532 | 4.09E-01 |
| 383 | 0.00E+00 | 433 | 4.82E-02 | 483 | 1.98E-01 | 533 | 4.17E-01 |
| 384 | 0.00E+00 | 434 | 5.22E-02 | 484 | 1.98E-01 | 534 | 4.22E-01 |
| 385 | 0.00E+00 | 435 | 5.55E-02 | 485 | 1.99E-01 | 535 | 4.29E-01 |
| 386 | 0.00E+00 | 436 | 6.38E-02 | 486 | 2.01E-01 | 536 | 4.34E-01 |
| 387 | 0.00E+00 | 437 | 7.17E-02 | 487 | 2.05E-01 | 537 | 4.39E-01 |
| 388 | 0.00E+00 | 438 | 6.96E-02 | 488 | 2.05E-01 | 538 | 4.45E-01 |
| 389 | 0.00E+00 | 439 | 7.52E-02 | 489 | 2.11E-01 | 539 | 4.49E-01 |
| 390 | 0.00E+00 | 440 | 8.10E-02 | 490 | 2.16E-01 | 540 | 4.57E-01 |
| 391 | 0.00E+00 | 441 | 8.96E-02 | 491 | 2.19E-01 | 541 | 4.62E-01 |
| 392 | 0.00E+00 | 442 | 9.99E-02 | 492 | 2.22E-01 | 542 | 4.69E-01 |
| 393 | 0.00E+00 | 443 | 1.08E-01 | 493 | 2.27E-01 | 543 | 4.76E-01 |
| 394 | 0.00E+00 | 444 | 1.18E-01 | 494 | 2.32E-01 | 544 | 4.82E-01 |
| 395 | 0.00E+00 | 445 | 1.24E-01 | 495 | 2.36E-01 | 545 | 4.91E-01 |
| 396 | 0.00E+00 | 446 | 1.36E-01 | 496 | 2.41E-01 | 546 | 4.94E-01 |
| 397 | 0.00E+00 | 447 | 1.49E-01 | 497 | 2.45E-01 | 547 | 5.06E-01 |
| 398 | 0.00E+00 | 448 | 1.64E-01 | 498 | 2.50E-01 | 548 | 5.13E-01 |
| 399 | 0.00E+00 | 449 | 1.82E-01 | 499 | 2.56E-01 | 549 | 5.19E-01 |
| 400 | 0.00E+00 | 450 | 1.97E-01 | 500 | 2.60E-01 | 550 | 5.31E-01 |
| 401 | 0.00E+00 | 451 | 2.17E-01 | 501 | 2.67E-01 | 551 | 5.41E-01 |
| 402 | 0.00E+00 | 452 | 2.30E-01 | 502 | 2.72E-01 | 552 | 5.52E-01 |
| 403 | 0.00E+00 | 453 | 2.53E-01 | 503 | 2.75E-01 | 553 | 5.60E-01 |
| 404 | 0.00E+00 | 454 | 2.67E-01 | 504 | 2.80E-01 | 554 | 5.73E-01 |
| 405 | 0.00E+00 | 455 | 2.78E-01 | 505 | 2.87E-01 | 555 | 5.83E-01 |
| 406 | 0.00E+00 | 456 | 2.88E-01 | 506 | 2.93E-01 | 556 | 5.92E-01 |
| 407 | 0.00E+00 | 457 | 2.99E-01 | 507 | 2.99E-01 | 557 | 6.01E-01 |
| 408 | 0.00E+00 | 458 | 3.10E-01 | 508 | 3.01E-01 | 558 | 6.03E-01 |
| 409 | 0.00E+00 | 459 | 3.09E-01 | 509 | 3.04E-01 | 559 | 6.08E-01 |
| 410 | 0.00E+00 | 460 | 3.12E-01 | 510 | 3.08E-01 | 560 | 6.15E-01 |
| 411 | 0.00E+00 | 461 | 3.03E-01 | 511 | 3.14E-01 | 561 | 6.17E-01 |
| 412 | 1.06E-02 | 462 | 2.93E-01 | 512 | 3.22E-01 | 562 | 6.21E-01 |
| 413 | 1.05E-02 | 463 | 2.84E-01 | 513 | 3.26E-01 | 563 | 6.31E-01 |
| 414 | 1.11E-02 | 464 | 2.76E-01 | 514 | 3.30E-01 | 564 | 6.41E-01 |
| 415 | 0.00E+00 | 465 | 2.70E-01 | 515 | 3.35E-01 | 565 | 6.50E-01 |
| 416 | 7.56E-03 | 466 | 2.60E-01 | 516 | 3.39E-01 | 566 | 6.64E-01 |
| 417 | 1.22E-02 | 467 | 2.53E-01 | 517 | 3.42E-01 | 567 | 6.76E-01 |
| 418 | 1.70E-02 | 468 | 2.48E-01 | 518 | 3.46E-01 | 568 | 6.87E-01 |
| 419 | 1.61E-02 | 469 | 2.42E-01 | 519 | 3.54E-01 | 569 | 6.98E-01 |
| 420 | 9.62E-03 | 470 | 2.35E-01 | 520 | 3.55E-01 | 570 | 7.08E-01 |
| 421 | 1.05E-02 | 471 | 2.32E-01 | 521 | 3.61E-01 | 571 | 7.24E-01 |
| 422 | 1.78E-02 | 472 | 2.31E-01 | 522 | 3.65E-01 | 572 | 7.37E-01 |
| 423 | 2.00E-02 | 473 | 2.27E-01 | 523 | 3.72E-01 | 573 | 7.50E-01 |
| 424 | 1.97E-02 | 474 | 2.24E-01 | 524 | 3.73E-01 | 574 | 7.61E-01 |
| 425 | 2.16E-02 | 475 | 2.19E-01 | 525 | 3.79E-01 | 575 | 7.76E-01 |
| 426 | 2.07E-02 | 476 | 2.17E-01 | 526 | 3.84E-01 | 576 | 7.89E-01 |
| 427 | 2.69E-02 | 477 | 2.13E-01 | 527 | 3.85E-01 | 577 | 8.01E-01 |
| 428 | 3.11E-02 | 478 | 2.10E-01 | 528 | 3.90E-01 | 578 | 8.12E-01 |
| 429 | 3.17E-02 | 479 | 2.06E-01 | 529 | 3.97E-01 | 579 | 8.22E-01 |
| | | | | | | 580 | 8.37E-01 |

| Spectral Power Distribution | | | | | | | |
|---|---|---|---|---|---|---|---|
| λ (nm) | Arb units | λ (nm) | Arb units | λ (nm) | Arb units | λ (nm) | Arb units |
| 581 | 8.46E-01 | 631 | 8.68E-01 | 681 | 3.32E-01 | 731 | 8.44E-02 |
| 582 | 8.56E-01 | 632 | 8.53E-01 | 682 | 3.27E-01 | 732 | 7.63E-02 |
| 583 | 8.67E-01 | 633 | 8.43E-01 | 683 | 3.17E-01 | 733 | 7.53E-02 |
| 584 | 8.79E-01 | 634 | 8.37E-01 | 684 | 3.07E-01 | 734 | 7.56E-02 |
| 585 | 8.86E-01 | 635 | 8.28E-01 | 685 | 3.01E-01 | 735 | 7.76E-02 |
| 586 | 8.94E-01 | 636 | 8.13E-01 | 686 | 2.91E-01 | 736 | 7.07E-02 |
| 587 | 9.02E-01 | 637 | 8.05E-01 | 687 | 2.83E-01 | 737 | 6.73E-02 |
| 588 | 9.16E-01 | 638 | 7.96E-01 | 688 | 2.75E-01 | 738 | 6.41E-02 |
| 589 | 9.29E-01 | 639 | 7.84E-01 | 689 | 2.68E-01 | 739 | 6.34E-02 |
| 590 | 9.35E-01 | 640 | 7.73E-01 | 690 | 2.61E-01 | 740 | 6.30E-02 |
| 591 | 9.40E-01 | 641 | 7.61E-01 | 691 | 2.50E-01 | 741 | 5.84E-02 |
| 592 | 9.44E-01 | 642 | 7.55E-01 | 692 | 2.46E-01 | 742 | 5.89E-02 |
| 593 | 9.50E-01 | 643 | 7.44E-01 | 693 | 2.41E-01 | 743 | 5.42E-02 |
| 594 | 9.57E-01 | 644 | 7.31E-01 | 694 | 2.36E-01 | 744 | 5.51E-02 |
| 595 | 9.62E-01 | 645 | 7.22E-01 | 695 | 2.31E-01 | 745 | 5.40E-02 |
| 596 | 9.71E-01 | 646 | 7.10E-01 | 696 | 2.25E-01 | 746 | 5.11E-02 |
| 597 | 9.74E-01 | 647 | 7.00E-01 | 697 | 2.15E-01 | 747 | 5.57E-02 |
| 598 | 9.78E-01 | 648 | 6.90E-01 | 698 | 2.06E-01 | 748 | 5.32E-02 |
| 599 | 9.78E-01 | 649 | 6.78E-01 | 699 | 2.05E-01 | 749 | 5.75E-02 |
| 600 | 9.87E-01 | 650 | 6.69E-01 | 700 | 1.95E-01 | 750 | 4.46E-02 |
| 601 | 9.89E-01 | 651 | 6.55E-01 | 701 | 1.89E-01 | 751 | 4.78E-02 |
| 602 | 9.85E-01 | 652 | 6.39E-01 | 702 | 1.83E-01 | 752 | 4.80E-02 |
| 603 | 9.95E-01 | 653 | 6.32E-01 | 703 | 1.77E-01 | 753 | 4.04E-02 |
| 604 | 9.97E-01 | 654 | 6.19E-01 | 704 | 1.78E-01 | 754 | 4.93E-02 |
| 605 | 9.95E-01 | 655 | 6.10E-01 | 705 | 1.69E-01 | 755 | 4.39E-02 |
| 606 | 1.00E+00 | 656 | 5.98E-01 | 706 | 1.62E-01 | 756 | 3.84E-02 |
| 607 | 9.95E-01 | 657 | 5.86E-01 | 707 | 1.59E-01 | 757 | 3.32E-02 |
| 608 | 9.95E-01 | 658 | 5.76E-01 | 708 | 1.54E-01 | 758 | 4.21E-02 |
| 609 | 9.94E-01 | 659 | 5.65E-01 | 709 | 1.51E-01 | 759 | 2.98E-02 |
| 610 | 9.95E-01 | 660 | 5.53E-01 | 710 | 1.45E-01 | 760 | 3.01E-02 |
| 611 | 9.95E-01 | 661 | 5.41E-01 | 711 | 1.43E-01 | 761 | 3.73E-02 |
| 612 | 9.89E-01 | 662 | 5.31E-01 | 712 | 1.38E-01 | 762 | 3.89E-02 |
| 613 | 9.89E-01 | 663 | 5.21E-01 | 713 | 1.37E-01 | 763 | 3.35E-02 |
| 614 | 9.87E-01 | 664 | 5.11E-01 | 714 | 1.29E-01 | 764 | 2.64E-02 |
| 615 | 9.79E-01 | 665 | 4.96E-01 | 715 | 1.28E-01 | 765 | 2.83E-02 |
| 616 | 9.76E-01 | 666 | 4.82E-01 | 716 | 1.23E-01 | 766 | 4.51E-02 |
| 617 | 9.71E-01 | 667 | 4.74E-01 | 717 | 1.24E-01 | 767 | 3.12E-02 |
| 618 | 9.62E-01 | 668 | 4.64E-01 | 718 | 1.18E-01 | 768 | 2.71E-02 |
| 619 | 9.63E-01 | 669 | 4.51E-01 | 719 | 1.16E-01 | 769 | 2.76E-02 |
| 620 | 9.56E-01 | 670 | 4.43E-01 | 720 | 1.08E-01 | 770 | 2.80E-02 |
| 621 | 9.49E-01 | 671 | 4.33E-01 | 721 | 1.05E-01 | 771 | 3.28E-02 |
| 622 | 9.45E-01 | 672 | 4.18E-01 | 722 | 1.04E-01 | 772 | 2.61E-02 |
| 623 | 9.35E-01 | 673 | 4.08E-01 | 723 | 1.01E-01 | 773 | 2.54E-02 |
| 624 | 9.26E-01 | 674 | 3.98E-01 | 724 | 1.03E-01 | 774 | 2.99E-02 |
| 625 | 9.13E-01 | 675 | 3.87E-01 | 725 | 9.66E-02 | 775 | 3.11E-02 |
| 626 | 9.13E-01 | 676 | 3.77E-01 | 726 | 9.33E-02 | 776 | 3.94E-02 |
| 627 | 9.04E-01 | 677 | 3.71E-01 | 727 | 8.92E-02 | 777 | 2.99E-02 |
| 628 | 8.93E-01 | 678 | 3.59E-01 | 728 | 8.43E-02 | 778 | 0.00E+00 |
| 629 | 8.88E-01 | 679 | 3.48E-01 | 729 | 8.74E-02 | 779 | 0.00E+00 |
| 630 | 8.79E-01 | 680 | 3.39E-01 | 730 | 7.73E-02 | 780 | 0.00E+00 |

**Measurement Uncertainty**

The following is the reported expanded uncertainty of the UL 6440T Type C Mirror Goniophotometer.

| Parameter | Uncertainty |
|---|---|
| Total Luminous Flux (%) | ± 7.5 |
| Luminous Intensity (%) | ± 7.5 |
| Temperature (°C) | ± 0.5 |
| Voltage DC TY720 (%) | ± 0.02 |
| Current DC TY720 (%) | ± 0.10 |
| Voltage AC WT210 (%) | ± 0.0585 |
| Current AC WT210 (%) | ± 0.0251 |
| Power AC WT210 (%) | ± 0.2261 |
| Frequency (50/60 Hz) WT210 (%) | ± 0.0040 |
| Power Factor WT210 (%) | ± 0.0601 |

The reported expanded uncertainty is based on the combined standard uncertainty multiplied by a coverage factor of k = 2. This value of k gives a coverage probability of approximately 95%, assuming a normal distribution. This determination of the measurement uncertainty has been done in accordance with international requirements including UKAS, BIPM Guide to the Expression of Uncertainty in Measurement and CIE 198:2011 and CIE S 025/E:2015 (based on RGB type LEDs).

Electrical measurement equipment used for the determination of results for this report, are compliant and meet the performance requirements of the measurement standards used.

---------- END OF REPORT ----------