

PRELIMINARY



## Soraa Internal Report: IES LM79-08

Test results reported for:

Part Number: SP20-11-36D-927-03

**Soraa PAR20, E26/120V, 2700K, 95CRI, 10.8W, 36degree**

Relevant Standards

IES LM-79

ANSI C78.377

IES PR-16

Soraa Lamp Lab

## 1.0 Description of test sample

|                           |                                   |
|---------------------------|-----------------------------------|
| Customer reference ID     | SP20-11-36D-927-03                |
| Manufacturer reference ID | SP20-11-36D-927-03                |
| Lamp description          | Vivid 2700K 95CRI 10.8W 36 degree |
| Rated voltage             | 120V                              |
| Rated power               | 10.8W                             |
| Nominal CCT               | 2700K                             |



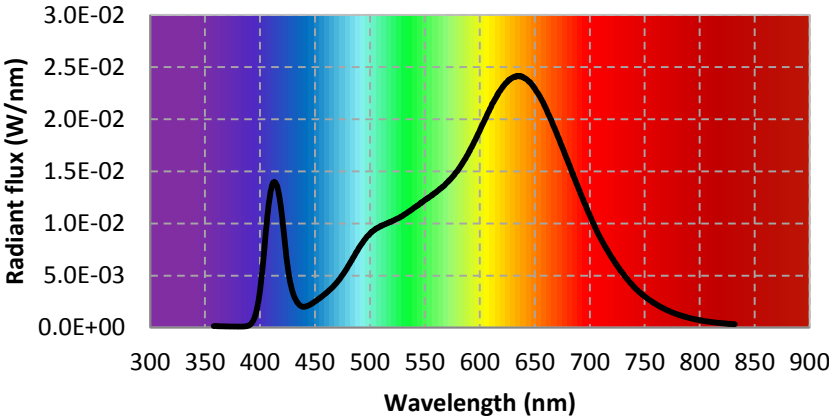
## 2.0 Results - Sphere Measurements

| Test conditions           |                            |
|---------------------------|----------------------------|
| Orientation               | Horizontal                 |
| Stabilization time (min)  | 50-55                      |
| Correction factor applied | Self absorption correction |
| Sphere geometry           | 65" Sphere                 |
|                           | 95% coating reflectance    |
|                           | 2pi geometry               |
| Ambient temperature (°C)  | 25±1                       |

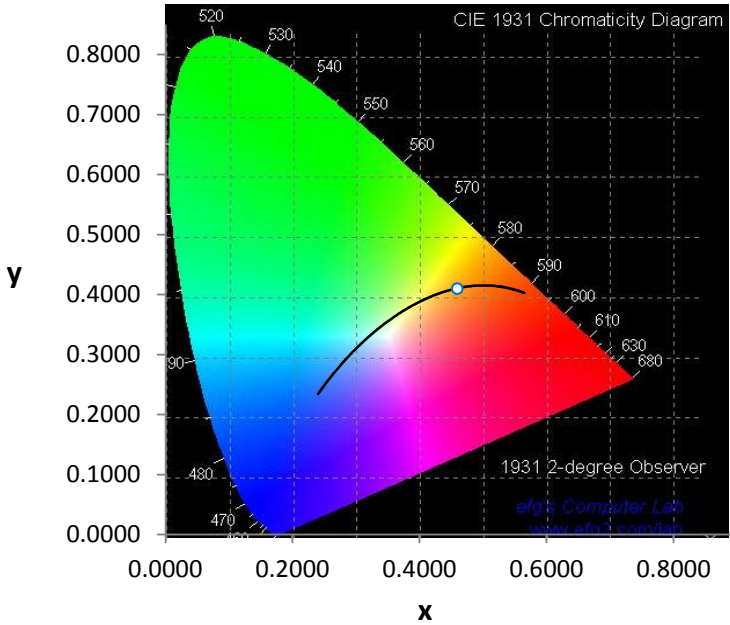
| Instrument            |                                |                    |                |  |
|-----------------------|--------------------------------|--------------------|----------------|--|
|                       | Instrument                     | Manufacture        | Model          |  |
| Photometric           | Spectrometer                   | Instrument systems | CAS 140T       |  |
|                       | Integrating sphere             | Labsphere          | 65"            |  |
|                       | Standard lamp                  | Labsphere          | CSFS-1400 lamp |  |
| Electrical instrument | Power supply for standard lamp | Labsphere          | LPS-150-0268   |  |
|                       | Power supply for aux lamp      | Labsphere          | LPS-100-0833   |  |
|                       | Power supply for test lamps    | APT                | Variplus 105   |  |
|                       | Power meter for test lamps     | Chroma             | 66202          |  |
| Thermometer           | Digital multimeter             | YOKOGAWA           | TY720          |  |

| Measurement results      |               |  |                   |       |
|--------------------------|---------------|--|-------------------|-------|
|                          | Photometric   |  | Electrical        |       |
| Total lumen (lm)         | 509           |  | Input voltage (V) | 120.0 |
| Luminous efficacy (lm/W) | 47            |  | Current (A)       | 0.097 |
| Chromaticity coordinates | $u' = 0.2630$ |  | Power (W)         | 10.9  |
|                          | $v' = 0.5270$ |  | pf                | 0.928 |
|                          | $x = 0.4600$  |  |                   |       |
|                          | $y = 0.4097$  |  |                   |       |
| CCT (K)                  | 2700          |  |                   |       |
| CRI                      | 96            |  |                   |       |
| R9                       | 93            |  |                   |       |
| Duv                      |               |  |                   |       |

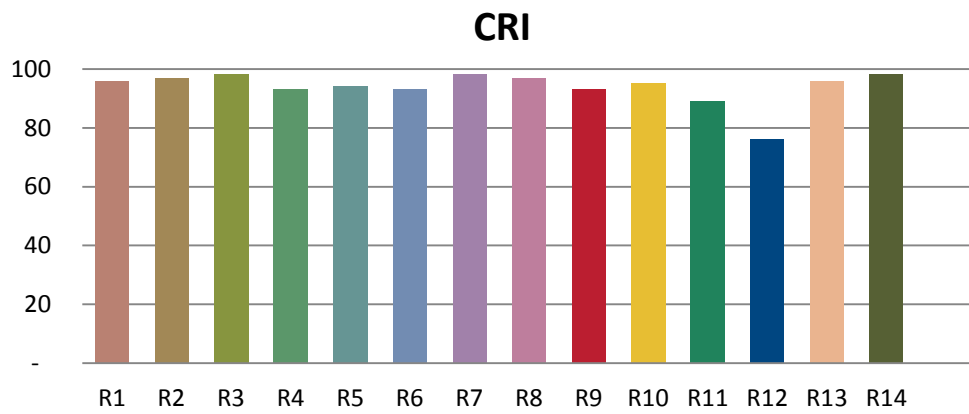
**Spectral power distribution**



**Chromaticity on CIE1931**



| CRI |    |
|-----|----|
| R1  | 96 |
| R2  | 97 |
| R3  | 98 |
| R4  | 93 |
| R5  | 94 |
| R6  | 93 |
| R7  | 98 |
| R8  | 97 |
| R9  | 93 |
| R10 | 95 |
| R11 | 89 |
| R12 | 76 |
| R13 | 96 |
| R14 | 98 |
|     |    |
| Ra  | 96 |



| Spectral Power Distribution |           |         |           |         |           |         |           |         |           |
|-----------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| WL (nm)                     | SPD(W/nm) | WL (nm) | SPD(W/nm) | WL (nm) | SPD(W/nm) | WL (nm) | SPD(W/nm) | WL (nm) | SPD(W/nm) |
| 380                         | 1.01E-04  | 421     | 9.75E-03  | 462     | 3.49E-03  | 503     | 9.30E-03  | 544     | 1.18E-02  |
| 381                         | 1.00E-04  | 422     | 8.80E-03  | 463     | 3.60E-03  | 504     | 9.36E-03  | 545     | 1.18E-02  |
| 382                         | 1.04E-04  | 423     | 7.78E-03  | 464     | 3.68E-03  | 505     | 9.45E-03  | 546     | 1.19E-02  |
| 383                         | 1.05E-04  | 424     | 6.78E-03  | 465     | 3.79E-03  | 506     | 9.53E-03  | 547     | 1.20E-02  |
| 384                         | 1.03E-04  | 425     | 5.98E-03  | 466     | 3.88E-03  | 507     | 9.57E-03  | 548     | 1.21E-02  |
| 385                         | 1.10E-04  | 426     | 5.25E-03  | 467     | 3.99E-03  | 508     | 9.64E-03  | 549     | 1.22E-02  |
| 386                         | 1.20E-04  | 427     | 4.61E-03  | 468     | 4.11E-03  | 509     | 9.69E-03  | 550     | 1.23E-02  |
| 387                         | 1.29E-04  | 428     | 4.12E-03  | 469     | 4.23E-03  | 510     | 9.74E-03  | 551     | 1.23E-02  |
| 388                         | 1.43E-04  | 429     | 3.66E-03  | 470     | 4.36E-03  | 511     | 9.80E-03  | 552     | 1.24E-02  |
| 389                         | 1.76E-04  | 430     | 3.31E-03  | 471     | 4.47E-03  | 512     | 9.84E-03  | 553     | 1.25E-02  |
| 390                         | 2.16E-04  | 431     | 3.01E-03  | 472     | 4.61E-03  | 513     | 9.89E-03  | 554     | 1.25E-02  |
| 391                         | 2.89E-04  | 432     | 2.78E-03  | 473     | 4.75E-03  | 514     | 9.92E-03  | 555     | 1.26E-02  |
| 392                         | 3.93E-04  | 433     | 2.58E-03  | 474     | 4.90E-03  | 515     | 9.97E-03  | 556     | 1.27E-02  |
| 393                         | 5.32E-04  | 434     | 2.41E-03  | 475     | 5.05E-03  | 516     | 1.00E-02  | 557     | 1.27E-02  |
| 394                         | 7.12E-04  | 435     | 2.29E-03  | 476     | 5.20E-03  | 517     | 1.01E-02  | 558     | 1.29E-02  |
| 395                         | 9.49E-04  | 436     | 2.17E-03  | 477     | 5.36E-03  | 518     | 1.01E-02  | 559     | 1.29E-02  |
| 396                         | 1.28E-03  | 437     | 2.09E-03  | 478     | 5.52E-03  | 519     | 1.01E-02  | 560     | 1.30E-02  |
| 397                         | 1.72E-03  | 438     | 2.04E-03  | 479     | 5.68E-03  | 520     | 1.02E-02  | 561     | 1.31E-02  |
| 398                         | 2.23E-03  | 439     | 2.01E-03  | 480     | 5.87E-03  | 521     | 1.03E-02  | 562     | 1.32E-02  |
| 399                         | 2.83E-03  | 440     | 2.00E-03  | 481     | 6.04E-03  | 522     | 1.03E-02  | 563     | 1.32E-02  |
| 400                         | 3.57E-03  | 441     | 2.03E-03  | 482     | 6.22E-03  | 523     | 1.04E-02  | 564     | 1.33E-02  |
| 401                         | 4.47E-03  | 442     | 2.04E-03  | 483     | 6.39E-03  | 524     | 1.04E-02  | 565     | 1.34E-02  |
| 402                         | 5.44E-03  | 443     | 2.08E-03  | 484     | 6.59E-03  | 525     | 1.05E-02  | 566     | 1.35E-02  |
| 403                         | 6.49E-03  | 444     | 2.13E-03  | 485     | 6.75E-03  | 526     | 1.05E-02  | 567     | 1.36E-02  |
| 404                         | 7.57E-03  | 445     | 2.17E-03  | 486     | 6.93E-03  | 527     | 1.06E-02  | 568     | 1.37E-02  |
| 405                         | 8.84E-03  | 446     | 2.23E-03  | 487     | 7.13E-03  | 528     | 1.07E-02  | 569     | 1.38E-02  |
| 406                         | 9.90E-03  | 447     | 2.30E-03  | 488     | 7.29E-03  | 529     | 1.07E-02  | 570     | 1.39E-02  |
| 407                         | 1.10E-02  | 448     | 2.37E-03  | 489     | 7.46E-03  | 530     | 1.07E-02  | 571     | 1.40E-02  |
| 408                         | 1.19E-02  | 449     | 2.43E-03  | 490     | 7.66E-03  | 531     | 1.08E-02  | 572     | 1.41E-02  |
| 409                         | 1.26E-02  | 450     | 2.50E-03  | 491     | 7.82E-03  | 532     | 1.09E-02  | 573     | 1.42E-02  |
| 410                         | 1.32E-02  | 451     | 2.57E-03  | 492     | 7.97E-03  | 533     | 1.10E-02  | 574     | 1.43E-02  |
| 411                         | 1.37E-02  | 452     | 2.66E-03  | 493     | 8.11E-03  | 534     | 1.10E-02  | 575     | 1.45E-02  |
| 412                         | 1.39E-02  | 453     | 2.73E-03  | 494     | 8.27E-03  | 535     | 1.11E-02  | 576     | 1.46E-02  |
| 413                         | 1.40E-02  | 454     | 2.80E-03  | 495     | 8.42E-03  | 536     | 1.12E-02  | 577     | 1.47E-02  |
| 414                         | 1.39E-02  | 455     | 2.90E-03  | 496     | 8.54E-03  | 537     | 1.13E-02  | 578     | 1.49E-02  |
| 415                         | 1.37E-02  | 456     | 2.97E-03  | 497     | 8.70E-03  | 538     | 1.13E-02  | 579     | 1.50E-02  |
| 416                         | 1.34E-02  | 457     | 3.05E-03  | 498     | 8.80E-03  | 539     | 1.14E-02  | 580     | 1.51E-02  |
| 417                         | 1.29E-02  | 458     | 3.14E-03  | 499     | 8.89E-03  | 540     | 1.15E-02  | 581     | 1.53E-02  |
| 418                         | 1.23E-02  | 459     | 3.23E-03  | 500     | 9.02E-03  | 541     | 1.16E-02  | 582     | 1.54E-02  |
| 419                         | 1.16E-02  | 460     | 3.30E-03  | 501     | 9.14E-03  | 542     | 1.16E-02  | 583     | 1.56E-02  |
| 420                         | 1.07E-02  | 461     | 3.39E-03  | 502     | 9.21E-03  | 543     | 1.17E-02  | 584     | 1.57E-02  |

| Spectral Power Distribution |           |         |           |         |           |         |           |         |           |
|-----------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| WL (nm)                     | SPD(W/nm) | WL (nm) | SPD(W/nm) | WL (nm) | SPD(W/nm) | WL (nm) | SPD(W/nm) | WL (nm) | SPD(W/nm) |
| 585                         | 1.59E-02  | 626     | 2.37E-02  | 667     | 1.94E-02  | 708     | 8.95E-03  | 749     | 3.07E-03  |
| 586                         | 1.61E-02  | 627     | 2.38E-02  | 668     | 1.91E-02  | 709     | 8.75E-03  | 750     | 2.98E-03  |
| 587                         | 1.62E-02  | 628     | 2.39E-02  | 669     | 1.89E-02  | 710     | 8.55E-03  | 751     | 2.91E-03  |
| 588                         | 1.65E-02  | 629     | 2.39E-02  | 670     | 1.86E-02  | 711     | 8.35E-03  | 752     | 2.84E-03  |
| 589                         | 1.66E-02  | 630     | 2.40E-02  | 671     | 1.83E-02  | 712     | 8.16E-03  | 753     | 2.75E-03  |
| 590                         | 1.68E-02  | 631     | 2.41E-02  | 672     | 1.81E-02  | 713     | 7.97E-03  | 754     | 2.68E-03  |
| 591                         | 1.70E-02  | 632     | 2.41E-02  | 673     | 1.78E-02  | 714     | 7.78E-03  | 755     | 2.61E-03  |
| 592                         | 1.72E-02  | 633     | 2.41E-02  | 674     | 1.76E-02  | 715     | 7.60E-03  | 756     | 2.54E-03  |
| 593                         | 1.74E-02  | 634     | 2.41E-02  | 675     | 1.73E-02  | 716     | 7.44E-03  | 757     | 2.46E-03  |
| 594                         | 1.76E-02  | 635     | 2.41E-02  | 676     | 1.71E-02  | 717     | 7.24E-03  | 758     | 2.39E-03  |
| 595                         | 1.79E-02  | 636     | 2.41E-02  | 677     | 1.68E-02  | 718     | 7.08E-03  | 759     | 2.33E-03  |
| 596                         | 1.80E-02  | 637     | 2.41E-02  | 678     | 1.65E-02  | 719     | 6.89E-03  | 760     | 2.26E-03  |
| 597                         | 1.83E-02  | 638     | 2.41E-02  | 679     | 1.62E-02  | 720     | 6.74E-03  | 761     | 2.21E-03  |
| 598                         | 1.85E-02  | 639     | 2.41E-02  | 680     | 1.60E-02  | 721     | 6.58E-03  | 762     | 2.14E-03  |
| 599                         | 1.87E-02  | 640     | 2.40E-02  | 681     | 1.57E-02  | 722     | 6.41E-03  | 763     | 2.07E-03  |
| 600                         | 1.89E-02  | 641     | 2.39E-02  | 682     | 1.55E-02  | 723     | 6.25E-03  | 764     | 2.03E-03  |
| 601                         | 1.92E-02  | 642     | 2.39E-02  | 683     | 1.52E-02  | 724     | 6.08E-03  | 765     | 1.97E-03  |
| 602                         | 1.94E-02  | 643     | 2.38E-02  | 684     | 1.49E-02  | 725     | 5.95E-03  | 766     | 1.90E-03  |
| 603                         | 1.96E-02  | 644     | 2.37E-02  | 685     | 1.46E-02  | 726     | 5.79E-03  | 767     | 1.86E-03  |
| 604                         | 1.98E-02  | 645     | 2.36E-02  | 686     | 1.44E-02  | 727     | 5.64E-03  | 768     | 1.80E-03  |
| 605                         | 2.01E-02  | 646     | 2.35E-02  | 687     | 1.41E-02  | 728     | 5.48E-03  | 769     | 1.75E-03  |
| 606                         | 2.03E-02  | 647     | 2.34E-02  | 688     | 1.38E-02  | 729     | 5.34E-03  | 770     | 1.69E-03  |
| 607                         | 2.05E-02  | 648     | 2.32E-02  | 689     | 1.36E-02  | 730     | 5.22E-03  | 771     | 1.64E-03  |
| 608                         | 2.07E-02  | 649     | 2.31E-02  | 690     | 1.33E-02  | 731     | 5.08E-03  | 772     | 1.61E-03  |
| 609                         | 2.10E-02  | 650     | 2.30E-02  | 691     | 1.30E-02  | 732     | 4.92E-03  | 773     | 1.56E-03  |
| 610                         | 2.11E-02  | 651     | 2.28E-02  | 692     | 1.28E-02  | 733     | 4.81E-03  | 774     | 1.51E-03  |
| 611                         | 2.14E-02  | 652     | 2.26E-02  | 693     | 1.25E-02  | 734     | 4.67E-03  | 775     | 1.46E-03  |
| 612                         | 2.16E-02  | 653     | 2.25E-02  | 694     | 1.23E-02  | 735     | 4.54E-03  | 776     | 1.42E-03  |
| 613                         | 2.18E-02  | 654     | 2.23E-02  | 695     | 1.20E-02  | 736     | 4.42E-03  | 777     | 1.38E-03  |
| 614                         | 2.20E-02  | 655     | 2.21E-02  | 696     | 1.18E-02  | 737     | 4.29E-03  | 778     | 1.33E-03  |
| 615                         | 2.21E-02  | 656     | 2.19E-02  | 697     | 1.15E-02  | 738     | 4.18E-03  | 779     | 1.30E-03  |
| 616                         | 2.24E-02  | 657     | 2.17E-02  | 698     | 1.13E-02  | 739     | 4.07E-03  | 780     | 1.27E-03  |
| 617                         | 2.25E-02  | 658     | 2.15E-02  | 699     | 1.10E-02  | 740     | 3.93E-03  |         |           |
| 618                         | 2.27E-02  | 659     | 2.13E-02  | 700     | 1.08E-02  | 741     | 3.84E-03  |         |           |
| 619                         | 2.28E-02  | 660     | 2.11E-02  | 701     | 1.05E-02  | 742     | 3.71E-03  |         |           |
| 620                         | 2.30E-02  | 661     | 2.08E-02  | 702     | 1.03E-02  | 743     | 3.63E-03  |         |           |
| 621                         | 2.31E-02  | 662     | 2.06E-02  | 703     | 1.01E-02  | 744     | 3.52E-03  |         |           |
| 622                         | 2.33E-02  | 663     | 2.04E-02  | 704     | 9.83E-03  | 745     | 3.42E-03  |         |           |
| 623                         | 2.34E-02  | 664     | 2.01E-02  | 705     | 9.61E-03  | 746     | 3.33E-03  |         |           |
| 624                         | 2.35E-02  | 665     | 1.99E-02  | 706     | 9.39E-03  | 747     | 3.25E-03  |         |           |
| 625                         | 2.36E-02  | 666     | 1.96E-02  | 707     | 9.14E-03  | 748     | 3.17E-03  |         |           |

### 3.0 Results - Goniometric Measurements

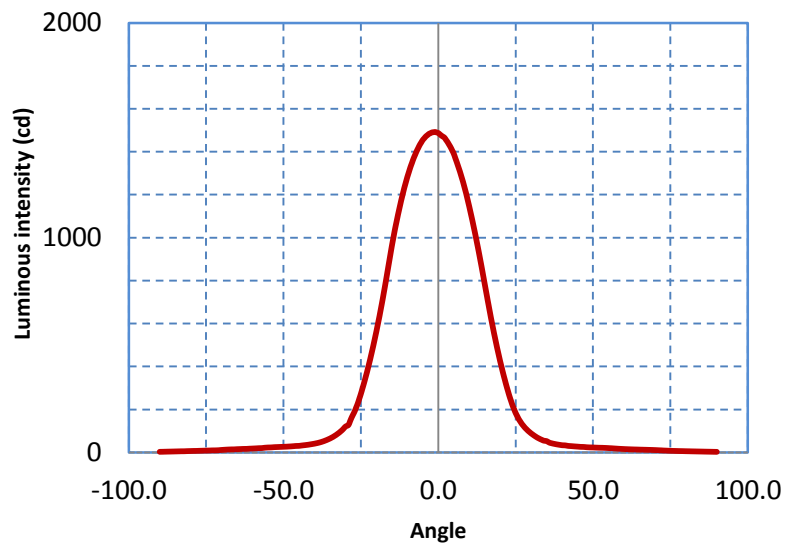
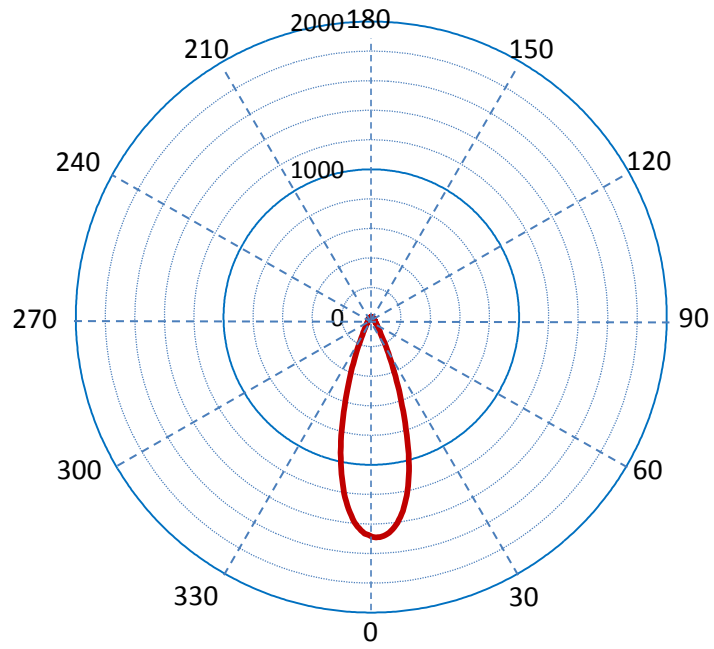
| Test conditions          |      |
|--------------------------|------|
| Goniometer distance (m)  | 1    |
| Temperature (°C)         | 25±1 |
| Stabilization time (min) | 50   |

| Instrument            |                             |             |              |  |
|-----------------------|-----------------------------|-------------|--------------|--|
|                       | Instrument                  | Manufacture | Model        |  |
| Photometric           | Photometer and color meter  | Minolta     | CL-200A      |  |
| Electrical instrument | Power supply for test lamps | APT         | Variplus 105 |  |
|                       | Power meter for test lamps  | Chroma      | 66202        |  |
| Thermometer           | Digital multimeter          | YOKOGAWA    | TY720        |  |

| Measurement results           |            |  |                   |        |
|-------------------------------|------------|--|-------------------|--------|
| Photometric                   |            |  | Electrical        |        |
| Central beam candle power(cd) | 1492       |  | Input voltage (V) | 120.0  |
| Beam Angle (°)                | 33         |  | Current (A)       | 0.097  |
| Field Angle (°)               | 54         |  | Power (W)         | 10.9   |
| Chromaticity coordinates      | u'= 0.2630 |  | pf                | 0.9280 |
|                               | v'= 0.5270 |  |                   |        |
|                               | x = 0.4600 |  |                   |        |
|                               | y = 0.4097 |  |                   |        |
| CCT (K)                       | 2700       |  |                   |        |



### Luminous intensity distribution

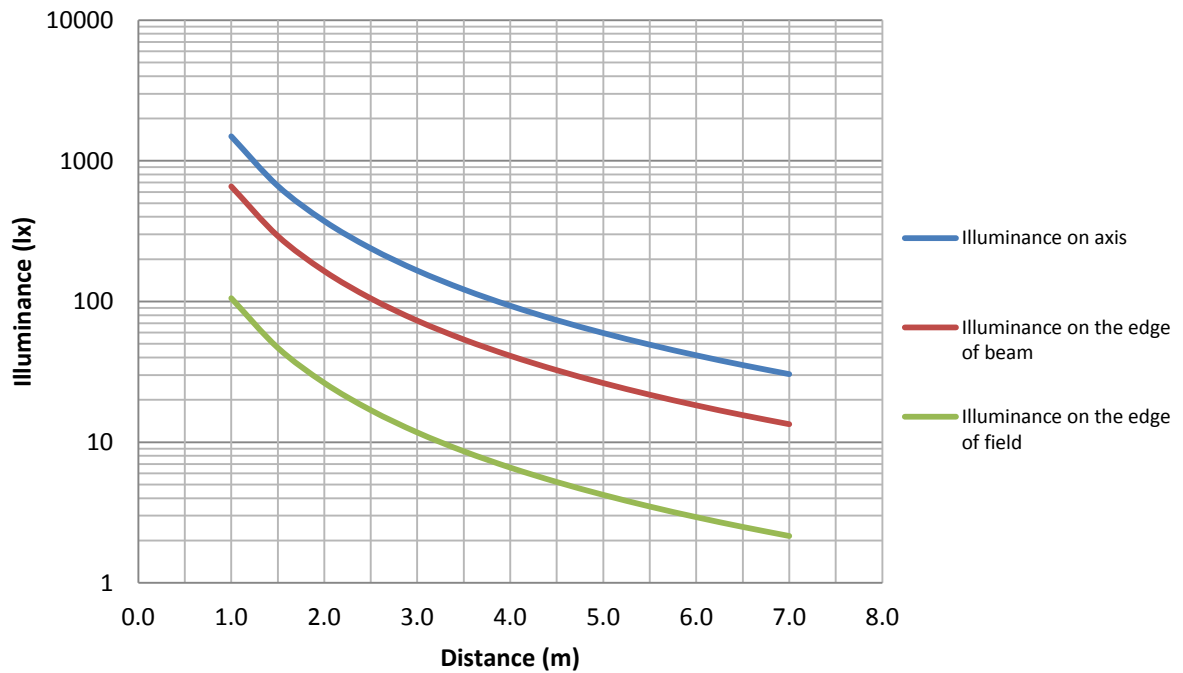


| Zonal Lumen Tabulation |        |       |           |             |       |
|------------------------|--------|-------|-----------|-------------|-------|
| Zones (°)              | Lumens | %lamp | Zones (°) | Lumens      | %lamp |
| 0-5                    | 33.5   | 6.6%  | 45-50     | 9.6         | 1.9%  |
| 5-10                   | 88.5   | 17.4% | 50-55     | 9.1         | 1.8%  |
| 10-15                  | 111.7  | 21.9% | 55-60     | 7.9         | 1.6%  |
| 15-20                  | 94.1   | 18.5% | 60-65     | 6.7         | 1.3%  |
| 20-25                  | 57.9   | 11.4% | 65-70     | 5.9         | 1.2%  |
| 25-30                  | 30.2   | 5.9%  | 70-75     | 4.6         | 0.9%  |
| 30-35                  | 18.5   | 3.6%  | 75-80     | 3.3         | 0.7%  |
| 35-40                  | 12.8   | 2.5%  | 80-85     | 2.5         | 0.5%  |
| 40-45                  | 10.6   | 2.1%  | 85-90     | 1.7         | 0.3%  |
|                        |        |       |           | Total lumen | 509   |

| Accumulated Zonal Lumen Tabulation |        |       |           |        |        |
|------------------------------------|--------|-------|-----------|--------|--------|
| Zones (°)                          | Lumens | %lamp | Zones (°) | Lumens | %lamp  |
| 0-5                                | 33.5   | 6.6%  | 0-50      | 467.5  | 91.8%  |
| 0-10                               | 122.1  | 24.0% | 0-55      | 476.6  | 93.6%  |
| 0-15                               | 233.7  | 45.9% | 0-60      | 484.5  | 95.1%  |
| 0-20                               | 327.9  | 64.4% | 0-65      | 491.2  | 96.5%  |
| 0-25                               | 385.8  | 75.8% | 0-70      | 497.1  | 97.6%  |
| 0-30                               | 416.0  | 81.7% | 0-75      | 501.7  | 98.5%  |
| 0-35                               | 434.5  | 85.3% | 0-80      | 505.0  | 99.2%  |
| 0-40                               | 447.3  | 87.8% | 0-85      | 507.5  | 99.7%  |
| 0-45                               | 457.9  | 89.9% | 0-90      | 509.2  | 100.0% |

| Center and edge illuminance, beam and field diameter |                |           |                            |            |                             |
|--|----------------|-----------|----------------------------|------------|-----------------------------|
| Distance (m)   | E on axis (lx) | Beam D(m) | E on the edge of beam (lx) | Field D(m) | E on the edge of field (lx) |
| 1.0  | 1492           | 0.59      | 658                        | 1.0        | 106                         |
| 1.5  | 663            | 0.89      | 292                        | 1.5        | 47                          |
| 2.0  | 373            | 1.18      | 164                        | 2.0        | 26                          |
| 2.5  | 239            | 1.48      | 105                        | 2.5        | 17                          |
| 3.0  | 166            | 1.78      | 73                         | 3.1        | 12                          |
| 3.5  | 122            | 2.07      | 54                         | 3.6        | 9                           |
| 4.0  | 93             | 2.37      | 41                         | 4.1        | 7                           |
| 4.5  | 74             | 2.67      | 32                         | 4.6        | 5                           |
| 5.0  | 60             | 2.96      | 26                         | 5.1        | 4                           |
| 5.5  | 49             | 3.26      | 22                         | 5.6        | 3                           |
| 6.0  | 41             | 3.55      | 18                         | 6.1        | 3                           |
| 6.5  | 35             | 3.85      | 16                         | 6.6        | 2                           |
| 7.0  | 30             | 4.15      | 13                         | 7.1        | 2                           |
| 7.5  | 27             | 4.44      | 12                         | 7.6        | 2                           |
| 8.0  | 23             | 4.74      | 10                         | 8.2        | 2                           |
| 8.5  | 21             | 5.04      | 9                          | 8.7        | 1                           |
| 9.0  | 18             | 5.33      | 8                          | 9.2        | 1                           |
| 9.5  | 17             | 5.63      | 7                          | 9.7        | 1                           |
| 10.0   | 15             | 5.92      | 7                          | 10.2       | 1                           |

**Beam illuminance vs. distance**



### Luminous Intensity Distribution

| Angle (°C) | CP (cd) | Angle (°C) | CP (cd) | Angle (°C) | CP (cd) | Angle (°C) | CP (cd) | Angle (°C) | CP (cd) |
|------------|---------|------------|---------|------------|---------|------------|---------|------------|---------|
| -90.0      | 2.7     | -69.5      | 12.0    | -49.0      | 26.8    | -28.5      | 144.9   | -8.0       | 1368.1  |
| -89.5      | 2.9     | -69.0      | 12.5    | -48.5      | 27.2    | -28.0      | 162.1   | -7.5       | 1385.2  |
| -89.0      | 3.0     | -68.5      | 12.9    | -48.0      | 27.6    | -27.5      | 176.8   | -7.0       | 1402.3  |
| -88.5      | 3.2     | -68.0      | 13.4    | -47.5      | 28.2    | -27.0      | 191.6   | -6.5       | 1416.9  |
| -88.0      | 3.4     | -67.5      | 13.7    | -47.0      | 28.7    | -26.5      | 209.9   | -6.0       | 1431.5  |
| -87.5      | 3.6     | -67.0      | 14.0    | -46.5      | 29.3    | -26.0      | 228.2   | -5.5       | 1443.3  |
| -87.0      | 3.8     | -66.5      | 14.1    | -46.0      | 30.0    | -25.5      | 250.4   | -5.0       | 1455.0  |
| -86.5      | 4.0     | -66.0      | 14.2    | -45.5      | 30.2    | -25.0      | 272.6   | -4.5       | 1463.3  |
| -86.0      | 4.1     | -65.5      | 14.6    | -45.0      | 30.5    | -24.5      | 297.3   | -4.0       | 1471.6  |
| -85.5      | 4.3     | -65.0      | 15.0    | -44.5      | 31.4    | -24.0      | 322.0   | -3.5       | 1477.4  |
| -85.0      | 4.5     | -64.5      | 15.3    | -44.0      | 32.3    | -23.5      | 348.8   | -3.0       | 1483.3  |
| -84.5      | 4.7     | -64.0      | 15.6    | -43.5      | 33.2    | -23.0      | 375.6   | -2.5       | 1486.7  |
| -84.0      | 4.9     | -63.5      | 15.9    | -43.0      | 34.0    | -22.5      | 404.6   | -2.0       | 1490.1  |
| -83.5      | 5.1     | -63.0      | 16.2    | -42.5      | 34.9    | -22.0      | 433.6   | -1.5       | 1491.1  |
| -83.0      | 5.3     | -62.5      | 16.4    | -42.0      | 35.8    | -21.5      | 464.8   | -1.0       | 1492.1  |
| -82.5      | 5.3     | -62.0      | 16.5    | -41.5      | 37.0    | -21.0      | 496.0   | -0.5       | 1489.7  |
| -82.0      | 5.4     | -61.5      | 16.9    | -41.0      | 38.2    | -20.5      | 529.4   | 0.0        | 1487.2  |
| -81.5      | 5.7     | -61.0      | 17.4    | -40.5      | 39.5    | -20.0      | 562.9   | 0.5        | 1481.4  |
| -81.0      | 6.1     | -60.5      | 17.7    | -40.0      | 40.7    | -19.5      | 598.3   | 1.0        | 1475.5  |
| -80.5      | 6.2     | -60.0      | 18.1    | -39.5      | 42.2    | -19.0      | 633.7   | 1.5        | 1470.6  |
| -80.0      | 6.4     | -59.5      | 18.4    | -39.0      | 43.7    | -18.5      | 672.0   | 2.0        | 1465.7  |
| -79.5      | 6.6     | -59.0      | 18.7    | -38.5      | 45.7    | -18.0      | 710.3   | 2.5        | 1455.5  |
| -79.0      | 6.8     | -58.5      | 19.2    | -38.0      | 47.6    | -17.5      | 751.0   | 3.0        | 1445.2  |
| -78.5      | 6.9     | -58.0      | 19.7    | -37.5      | 49.9    | -17.0      | 791.6   | 3.5        | 1433.0  |
| -78.0      | 7.0     | -57.5      | 19.9    | -37.0      | 52.3    | -16.5      | 834.1   | 4.0        | 1420.8  |
| -77.5      | 7.3     | -57.0      | 20.1    | -36.5      | 55.2    | -16.0      | 876.6   | 4.5        | 1406.2  |
| -77.0      | 7.6     | -56.5      | 21.0    | -36.0      | 58.0    | -15.5      | 918.7   | 5.0        | 1391.5  |
| -76.5      | 7.8     | -56.0      | 21.9    | -35.5      | 61.3    | -15.0      | 960.9   | 5.5        | 1371.0  |
| -76.0      | 8.0     | -55.5      | 22.4    | -35.0      | 64.5    | -14.5      | 999.4   | 6.0        | 1350.5  |
| -75.5      | 8.2     | -55.0      | 22.9    | -34.5      | 68.4    | -14.0      | 1038.0  | 6.5        | 1329.0  |
| -75.0      | 8.4     | -54.5      | 23.0    | -34.0      | 72.3    | -13.5      | 1072.7  | 7.0        | 1307.5  |
| -74.5      | 8.6     | -54.0      | 23.2    | -33.5      | 76.9    | -13.0      | 1107.4  | 7.5        | 1283.6  |
| -74.0      | 8.9     | -53.5      | 23.8    | -33.0      | 81.4    | -12.5      | 1139.6  | 8.0        | 1259.7  |
| -73.5      | 9.1     | -53.0      | 24.4    | -32.5      | 86.8    | -12.0      | 1171.8  | 8.5        | 1232.8  |
| -73.0      | 9.4     | -52.5      | 24.7    | -32.0      | 92.1    | -11.5      | 1201.1  | 9.0        | 1206.0  |
| -72.5      | 9.5     | -52.0      | 25.0    | -31.5      | 98.3    | -11.0      | 1230.4  | 9.5        | 1175.7  |
| -72.0      | 9.6     | -51.5      | 25.3    | -31.0      | 104.6   | -10.5      | 1256.3  | 10.0       | 1145.4  |
| -71.5      | 9.9     | -51.0      | 25.6    | -30.5      | 112.2   | -10.0      | 1282.1  | 10.5       | 1113.2  |
| -71.0      | 10.2    | -50.5      | 25.9    | -30.0      | 119.9   | -9.5       | 1305.1  | 11.0       | 1081.0  |
| -70.5      | 10.8    | -50.0      | 26.2    | -29.5      | 123.8   | -9.0       | 1328.0  | 11.5       | 1046.8  |
| -70.0      | 11.5    | -49.5      | 26.5    | -29.0      | 127.7   | -8.5       | 1348.1  | 12.0       | 1012.6  |

### Luminous Intensity Distribution

| Angle (°C) | CP (cd) | Angle (°C) | CP (cd) | Angle (°C) | CP (cd) | Angle (°C) | CP (cd) |  |  |
|------------|---------|------------|---------|------------|---------|------------|---------|--|--|
| 12.5       | 976.5   | 33.0       | 61.4    | 53.5       | 21.2    | 74.0       | 8.1     |  |  |
| 13.0       | 940.4   | 33.5       | 58.2    | 54.0       | 20.9    | 74.5       | 7.8     |  |  |
| 13.5       | 902.3   | 34.0       | 55.1    | 54.5       | 20.5    | 75.0       | 7.5     |  |  |
| 14.0       | 864.2   | 34.5       | 53.8    | 55.0       | 20.1    | 75.5       | 7.3     |  |  |
| 14.5       | 824.5   | 35.0       | 52.5    | 55.5       | 19.7    | 76.0       | 7.0     |  |  |
| 15.0       | 784.8   | 35.5       | 48.7    | 56.0       | 19.3    | 76.5       | 6.8     |  |  |
| 15.5       | 745.3   | 36.0       | 44.9    | 56.5       | 18.8    | 77.0       | 6.6     |  |  |
| 16.0       | 705.8   | 36.5       | 43.1    | 57.0       | 18.3    | 77.5       | 6.4     |  |  |
| 16.5       | 667.2   | 37.0       | 41.2    | 57.5       | 17.8    | 78.0       | 6.2     |  |  |
| 17.0       | 628.6   | 37.5       | 39.7    | 58.0       | 17.3    | 78.5       | 6.1     |  |  |
| 17.5       | 592.4   | 38.0       | 38.2    | 58.5       | 16.8    | 79.0       | 6.0     |  |  |
| 18.0       | 556.2   | 38.5       | 36.9    | 59.0       | 16.4    | 79.5       | 5.8     |  |  |
| 18.5       | 522.1   | 39.0       | 35.6    | 59.5       | 16.1    | 80.0       | 5.6     |  |  |
| 19.0       | 488.0   | 39.5       | 34.6    | 60.0       | 15.7    | 80.5       | 5.4     |  |  |
| 19.5       | 456.1   | 40.0       | 33.5    | 60.5       | 15.4    | 81.0       | 5.3     |  |  |
| 20.0       | 424.3   | 40.5       | 33.1    | 61.0       | 15.0    | 81.5       | 5.1     |  |  |
| 20.5       | 394.9   | 41.0       | 32.7    | 61.5       | 14.7    | 82.0       | 4.9     |  |  |
| 21.0       | 365.5   | 41.5       | 31.5    | 62.0       | 14.5    | 82.5       | 4.7     |  |  |
| 21.5       | 338.4   | 42.0       | 30.3    | 62.5       | 14.2    | 83.0       | 4.6     |  |  |
| 22.0       | 311.3   | 42.5       | 29.7    | 63.0       | 14.0    | 83.5       | 4.4     |  |  |
| 22.5       | 286.6   | 43.0       | 29.2    | 63.5       | 13.8    | 84.0       | 4.3     |  |  |
| 23.0       | 261.8   | 43.5       | 28.6    | 64.0       | 13.6    | 84.5       | 4.2     |  |  |
| 23.5       | 240.3   | 44.0       | 28.0    | 64.5       | 13.3    | 85.0       | 4.0     |  |  |
| 24.0       | 218.7   | 44.5       | 27.5    | 65.0       | 13.1    | 85.5       | 3.9     |  |  |
| 24.5       | 201.1   | 45.0       | 27.0    | 65.5       | 12.9    | 86.0       | 3.7     |  |  |
| 25.0       | 183.4   | 45.5       | 26.4    | 66.0       | 12.7    | 86.5       | 3.6     |  |  |
| 25.5       | 169.2   | 46.0       | 25.8    | 66.5       | 12.5    | 87.0       | 3.4     |  |  |
| 26.0       | 155.0   | 46.5       | 25.6    | 67.0       | 12.3    | 87.5       | 3.3     |  |  |
| 26.5       | 143.9   | 47.0       | 25.4    | 67.5       | 12.1    | 88.0       | 3.1     |  |  |
| 27.0       | 132.8   | 47.5       | 24.7    | 68.0       | 11.9    | 88.5       | 3.0     |  |  |
| 27.5       | 124.0   | 48.0       | 24.0    | 68.5       | 11.7    | 89.0       | 2.8     |  |  |
| 28.0       | 115.1   | 48.5       | 23.7    | 69.0       | 11.5    | 89.5       | 2.7     |  |  |
| 28.5       | 108.0   | 49.0       | 23.3    | 69.5       | 11.2    | 90.0       | 2.5     |  |  |
| 29.0       | 100.8   | 49.5       | 23.2    | 70.0       | 10.9    |            |         |  |  |
| 29.5       | 94.7    | 50.0       | 23.0    | 70.5       | 10.6    |            |         |  |  |
| 30.0       | 88.6    | 50.5       | 22.7    | 71.0       | 10.3    |            |         |  |  |
| 30.5       | 83.3    | 51.0       | 22.3    | 71.5       | 9.9     |            |         |  |  |
| 31.0       | 78.1    | 51.5       | 22.0    | 72.0       | 9.6     |            |         |  |  |
| 31.5       | 73.5    | 52.0       | 21.8    | 72.5       | 9.2     |            |         |  |  |
| 32.0       | 68.8    | 52.5       | 21.6    | 73.0       | 8.8     |            |         |  |  |
| 32.5       | 65.1    | 53.0       | 21.5    | 73.5       | 8.4     |            |         |  |  |