



**Multiactuator  
deformable lens**

**SN05201**

**AO code: AOL1816**

**Product specifications**

**25/08/20**

## Adaptive optic specifications

|                  |             |      |             |
|------------------|-------------|------|-------------|
| AO CODE          | AOL1816     |      |             |
| SN               | SN05201     |      |             |
| Dimension        | 2"          |      |             |
| Material         | Willow      |      |             |
| Coating          | No          |      |             |
| Clear aperture   | 16 mm       |      |             |
| Notes            | -           |      |             |
| Actuators type   | Bimorph     |      |             |
| Actuators number | 18          |      |             |
| AOL Vflat folder | -           |      |             |
|                  | Lower limit | Rest | Upper limit |
| Voltage range    | -100V       | 0 V  | 125 V       |
| Commands range   | -0.8        | 0    | 1           |

## Measurements Set-up

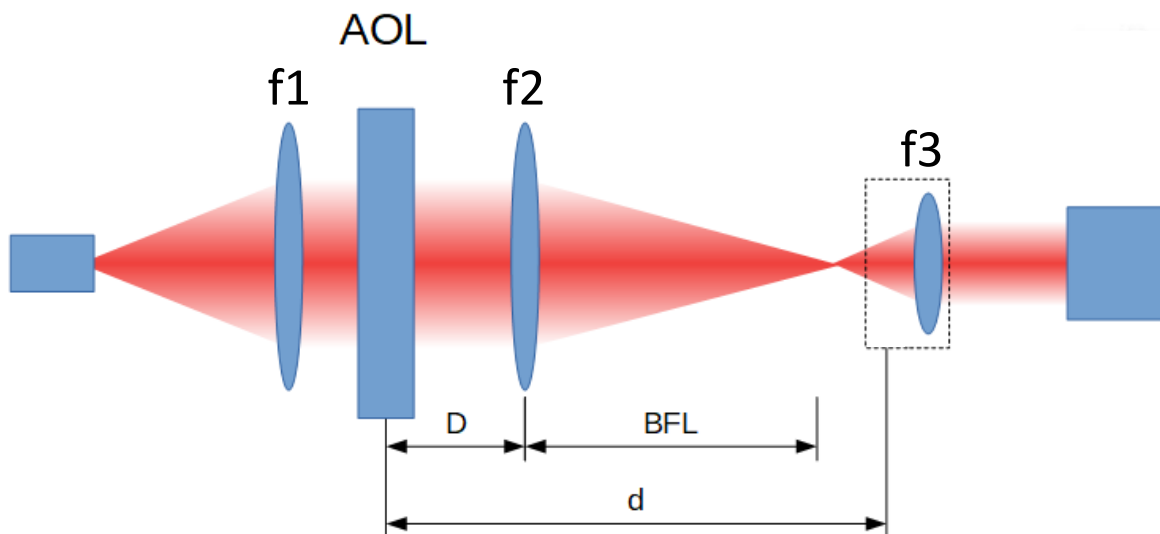


Figure 1: Characterization set-up. From left to right: Laser source, collimating lens ( $f_1=200$  mm), adaptive lens, first telescope lens ( $f_2=180$  mm), second telescope lens ( $f_3=60$  mm).  $D=160$  mm,  $d=340$  mm,  $BFL=180$  mm.



## Initial status

|                                   |                                                               |                |
|-----------------------------------|---------------------------------------------------------------|----------------|
| Focus shift                       | 0.02 D                                                        |                |
| Main initial aberration           | Astigmatism -0.22<br>RMS@633nm<br>Spherical 0.01<br>RMS@633nm | 0.27 RMS@633nm |
| Grid dimensions                   | 33x33                                                         |                |
| Temperature                       | 23.5 °C                                                       |                |
| Beam diameter (1/e <sup>2</sup> ) | >> 16 mm                                                      |                |
|                                   |                                                               |                |

Figure 2: Initial settings

## Calibration

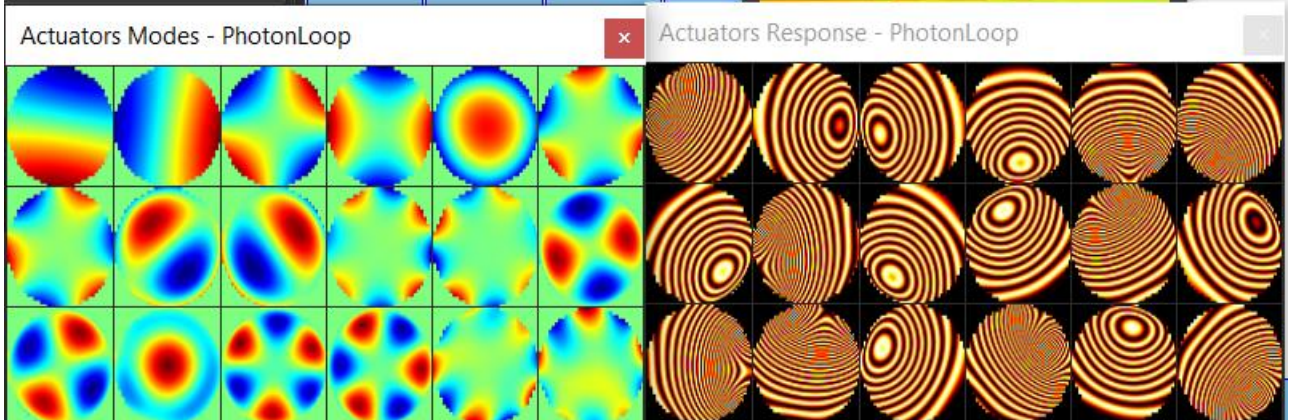
|                                                                                                                                                                                                                 |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Dynamic Range (DR)                                                                                                                                                                                              | 75 %      |
| Average                                                                                                                                                                                                         | 30 frames |
| Setting time                                                                                                                                                                                                    | 0.1 s     |
|  <p>             Actuators Modes - PhotonLoop           </p> <p>             Actuators Response - PhotonLoop           </p> |           |

Figure 3 Lens modes and the influence functions.

## AO calibration

|                        |                 |
|------------------------|-----------------|
| RMS before Closed Loop | 0.27 RMS@633nm  |
| RMS after Closed Loop  | 0.021 RMS@633nm |
| Modes used             | 14 # of modes   |

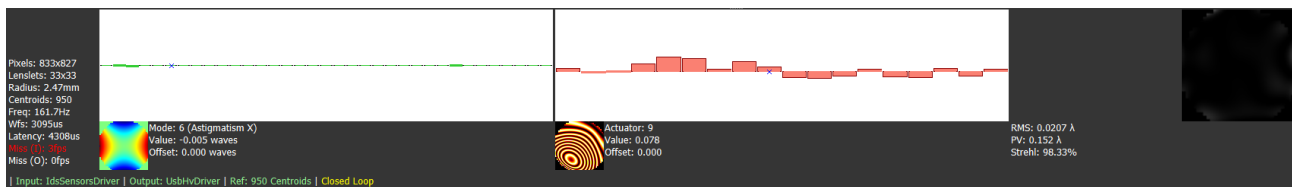


Figure 4 Closed loop settings

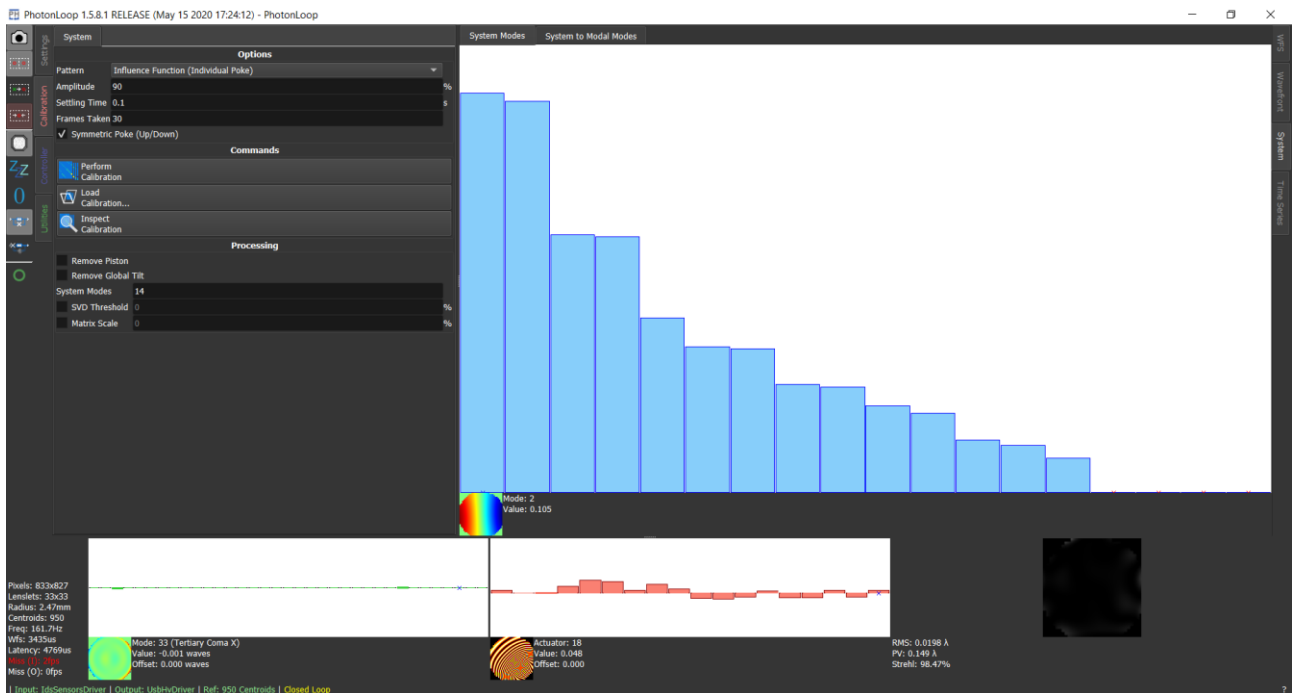


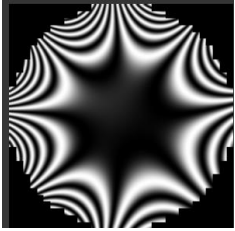
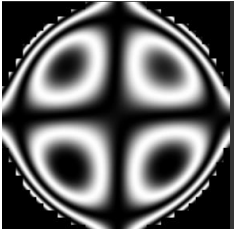
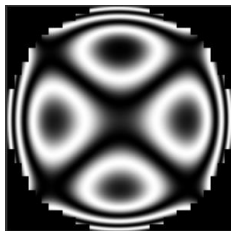
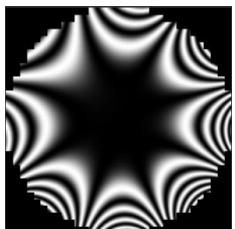
Figure 5 Calibration modes results

## Generation of modes in CLOSED LOOP

|                       |              |
|-----------------------|--------------|
| Actuators max voltage | Above 90% DR |
|-----------------------|--------------|

| Mode   | RMS waves @633nm | PtV waves @633nm | Wavefront interferogram |
|--------|------------------|------------------|-------------------------|
| Tip +  | 10.8             | 43.0             |                         |
| Tip -  | -11.2            | 44.5             |                         |
| Tilt + | 10               | 40.0             |                         |
| Tilt - | -8.18            | 32.6             |                         |

|                 |        |      |  |
|-----------------|--------|------|--|
| Astigmatism y + | 4.13   | 21.2 |  |
| Astigmatism y - | -4.66  | 23.9 |  |
| Defocus +       | 3.36   | 12.5 |  |
| Defocus-        | -3.21  | 12.0 |  |
| Astigmatism x + | 3.9    | 19.1 |  |
| Astigmatism x - | -4.13  | 20.3 |  |
| Trefoil y +     | 1.31   | 8.0  |  |
| Trefoil y -     | -2.01  | 11.7 |  |
| Coma y +        | 1.1    | 7.42 |  |
| Coma y -        | -1.06  | 7.15 |  |
| Coma x +        | 0.917  | 6.26 |  |
| Coma x -        | -0.967 | 6.55 |  |
| Trefoil x +     | 1.62   | 9.43 |  |
| Trefoil x -     | -1.29  | 7.67 |  |

|                     |        |       |                                                                                       |
|---------------------|--------|-------|---------------------------------------------------------------------------------------|
| Tetrafoil y +       | 0.54   | 4.8   |    |
| Tetrafoil y -       | -0.65  | 5.71  |                                                                                       |
| 2°Astigmatism y +   | 0.267  | 2.27  |    |
| 2°Astigmatism y -   | -0.267 | 2.25  |                                                                                       |
| Primary Spherical + | 0.10   | 0.532 |    |
| Primary Spherical - | 0.19   | 0.943 |                                                                                       |
| 2°Astigmatism x +   | 0.264  | 2.01  |   |
| 2°Astigmatism x -   | -0.261 | 1.97  |                                                                                       |
| Tetrafoil x +       | 0.518  | 4.36  |  |
| Tetrafoil x -       | -0.54  | 4.6   |                                                                                       |

| REFERENCE VALUES open loop<br>(Total PV and RMS) |                                 |                   |
|--------------------------------------------------|---------------------------------|-------------------|
| Aberrations                                      | Peak to Valley<br>(waves@633nm) | rms (waves@633nm) |
| Tip                                              | 23.0                            | 6.0               |
| Tilt                                             | 21.0                            | 5.5               |
| Vertical Astigmatism                             | 12.0                            | 2.5               |
| Defocus                                          | 9.0                             | 2.7               |
| Oblique Astigmatism                              | 13.0                            | 3.0               |
| Vertical Trefoil                                 | 7.5                             | 1.4               |
| Vertical Coma                                    | 4.0                             | 0.7               |
| Horizontal Coma                                  | 3.6                             | 0.7               |

|                                  |     |     |
|----------------------------------|-----|-----|
| Oblique Trefoil                  | 7.0 | 1.3 |
| Vertical Quadrifoil              | 4.6 | 0.7 |
| Vertical Secondary Astigmatism   | 1.3 | 0.2 |
| Horizontal Secondary Astigmatism | 1.3 | 0.2 |
| Oblique Quadrifoil               | 4.3 | 0.7 |

## Technical drawings

