

The MAORY Laser Guide Star Wavefront Sensor Design Status

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Summary

MAORY will be the multi-conjugate adaptive optics module feeding the high resolution camera MICADO at the European Extremely Large Telescope (E-ELT) first light.

In order to ensure high and homogeneous image quality over the MICADO field of view and high sky coverage, the baseline is to operate wavefront sensing using six Sodium Laser Guide Stars.

The Laser Guide Star Wavefront Sensor (LGS WFS) is the MAORY sub-system devoted to real-time measurement of the high order wavefront distortions. In the current design, six Shack-Hartmann Wavefront Sensors of order 80×80 , operate at 500Hz. In case of a phased E-ELT approach, the LGS WFS may also work with only four reference sources.

The light from the E-ELT is propagated through the MAORY common path optics. Upon wavefront compensation by the Post-focal deformable mirrors, the light is split by a Dichroic beamsplitter: the light of wavelength shorter than about 600 nm is propagated to the LGS Path Optics and then to the LGS WFS sub-system.

For each LGS WFS channel, a fast tip-tilt compensation of the Laser jitter, probably at the laser launcher level, and a slower focus correction of the Sodium altitude variation are foreseen.

Since the LGS WFS detector size seems to be limited to about 800×800 pixels, a critical aspect that could impact the MAORY performance is related to the Shack-Hartmann sub-aperture field of view: it should be large enough to contain the projected elongated spot, but avoiding an exaggerated spot undersampling that could introduce strong non-linearities.

In this paper we describe the MAORY LGS WFS current design, including opto-mechanics, trade-offs and possible future improvements.

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