

## One laser, two LGS for two WFS: technology, on-sky demonstration and first results

*Wednesday 30 October 2019 09:00 (20 minutes)*

MAVIS (MCAO-Assisted Visible Imager & Spectrograph) answers the ESO proposal for a new instrument to equip UT4 at the Paranal Observatory, using the available Adaptive Optics Facility (4LGSF and DSM). It is developed within an Australian-European consortium, leaded by Australia. MAVIS shall deliver near-diffraction limited image quality in the visible over a field-of-view of  $30'' \times 30''$ . To reach such a challenging goal, the simulations conducted during the ongoing phase A study of MAVIS have shown that a minimum of six LGS/WFS will be needed to achieve the required correction over the large scientific field-of-view. The cost and technological complexity associated to adding two or even four lasers on UT4 have led the team to look for alternative solutions, by possibly splitting the existing lasers in order to create two LGS. The statistical analysis of two years of flux return in the WFS of GALACSI has shown that splitting the lasers should still deliver enough photons for MAVIS. Technical solutions to create two LGS from one laser have then be looked for, and Diffractive Optical Elements (DOE) have been identified as a cheap and simple solution fulfilling the requirements. An off-the-shelves DOE delivering a separation of  $18''$  on-sky has been procured and tested at the Wendelstein Laser Guide Star Unit experimental facility at La Palma, with the support from IAC. During two nights on September 13th and 14th 2019, on-sky measurements have been conducted to determine the flux balance, the separation, and the differential tip-tilt between the two LGS. This test validated the feasibility of the method and the obtained data will be used for defining the final and optimized DOE for MAVIS.

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