

MAORY LGS WFS trade-off study: Dealing with the Impact of truncation using regularization.

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MAORY is the Laser Guide Star (LGS) Multi Conjugated Adaptive Optics (MCAO) module of ESO's ELT that will provide a corrected field of view (FOV) of 1 arcminute. The project is in its Preliminary Design Study phase. We present the results of a trade-off study where we analyze the impact of design choices of the LGS WFS on MCAO performance and robustness. We use for that the FRIM+OCTOPUS end-to-end simulation tool. We focus on the design trade-off of a classical Shack-Hartmann WFS, addressing in particular the choice of the pixel scale and subaperture FOV and study the impact of spot size and spot truncation on both the Photon and Read out noise propagation and static bias of slopes. We show that using careful regularization and some other simple algorithmic tricks permit to deal with this problem in a simple and robust way. The performance is then studied for a set of typical CN2 and Na profile conditions and some recommendations are drawn.

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