
”CiaoCiao WFS”: sensing phase discontinuities at the Extremely Large Telescope

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Abstract

The upcoming extremely large telescopes will have to deal with the so-called ”pupil fragmentation” effect: either the presence of thick spider legs supporting the secondary mirror of the Extremely Large Telescope (ELT), or the segmented mirror of the Giant Magellan Telescope may induce unseen phase discontinuities that could limit the performance of the adaptive optics correction. In this context, we proposed the ”CiaoCiao WFS” concept for the ELT: a rotational shearing interferometer to sense phase differences between the pupil islands. In this work, we present the progress of the ”CiaoCiao WFS” feasibility study that is being carried out from both a numerical and an experimental point of view. On the one hand, we present the output of the numerical simulations where the phase discontinuities are sensed by the ”CiaoCiao WFS” in case the input signal is given by the residuals from the Multiconjugate adaptive Optics Relay For ELT Observations (MORFEO). The residuals of the adaptive optics correction also include the compensation for the low-wind effect. On the other hand, we show the status of the optical setup that we are developing in our laboratories to validate and test the proposed concept of wavefront sensor.

Keywords: ELT, MORFEO, pupil fragmentation, wavefront sensor

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