

The laboratory characterization of the SHARK-NIR Adaptive Optics channel

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The typical coronagraphy contrast needed to reveal a giant planet from the ground is of the order of 10^{-5} - 10^{-6} . These numbers can be reached with coronagraphy techniques like the Apodized Pupil Lyot, the Shaped Pupil, and the Four Quadrant Phase Mask coronagraphs, all methods that require Adaptive Optics (AO) systems to retrieve high quality wavefronts. SHARK-NIR is the camera for the Large Binocular Telescope (LBT) designed to use these coronagraphic techniques, and to be interfaced to the telescope in a strategic position, in order to exploit the already corrected wavefront from the LBT adaptive secondary mirror. For SHARK-NIR, the requirement on the wavefront quality is about 60 nm, plus the correction of the Non Common Path Aberrations (NCPA). For this reason, SHARK-NIR hosts an inner AO channel with two different scopes: correct the telescope jitter (to reach 3-5 mas for the tip-tilt) and reduce the NCPA under the 30 nm threshold. The NCPA characterization will be performed using Phase Diversity, with the scientific detector plus a deployable lens together acting as wavefront sensor. SHARK-NIR is now in its AIV phase at INAF-OAPD laboratories, where an intense characterization of the components is in progress before the integration. Here we present the results of the performance of the TT-loop and of the hardware components of the SHARK-NIR AO channel, the capability of the system to correct the NCPA, and finally the laboratory tests to tune the parameters of the Phase Diversity software.

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