
Phasing tests with the Natural Guide star Wavefront Sensor Prototype for the Giant Magellan Telescope

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Abstract

The Giant Magellan telescope adaptive optics system will use two different diffraction-limited imaging modes. One of them is the Natural Guide Star Adaptive Optics mode (NGAO). NGAO uses 7 Adaptive Secondary Mirror (ASM) segments to provide wavefront correction and a single natural guide star coupled with a post focal wavefront sensor called the Natural Guide Star Wavefront Sensor (NGWS). The NGWS has two different channels: the main one featuring a high spatial sampling pyramid sensor dedicated to the fast frame rate correction of atmospheric turbulence and the second one featuring a Holographic Dispersed Fringe Sensor (HDFS) dedicated to phasing correction of the seven segments of the GMT at a low frame rate. The Arcetri AO group and GMTO collaborated to design and build a prototype of the NGWS that replicates all aspects of optical sensitivity including optical design, camera selection and data reduction. The NGWS prototype was fully integrated at the University of Arizona in the High Contrast Adaptive Optics Testbed (HCAO) during summer 2023 and has been tested to demonstrate its capability to keep the segments of the GMT in phase during a high-performance AO loop. In this contribution, we report on the experiment results and the lessons learned for future tests.

Keywords: Giant Magellan Telescope, Phasing, Pyramid, Holographic Dispersed Fringe Sensor

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