

The NGS AO system for GMT: performance analysis and simulations

Monday, 28 October 2019 14:50 (20 minutes)

In this talk we will present an update on the performance analysis of the Natural Guide-star Adaptive Optics (NGAO) system for the Giant Magellan Telescope (GMT). The NGAO mode uses a visible-light pyramid WFS (PWFS) with 92×92 subapertures for wavefront sensing, and the Adaptive Secondary Mirror (ASM) with ~ 4700 actuators for wavefront correction. When using a bright star ($R < 10$) and under median seeing conditions ($0.63''$ at 500 nm), the NGAO system shall provide a Strehl Ratio better than 75% in K band, PSF contrast better than 10^{-5} at 127 mas ($4\lambda/D$) in L band, and a segment piston error less than 45 nm RMS. The NGAO system will drive the correction of atmospheric turbulence and M1 segment errors (either segment rigid body motion or figure) with the matching ASM segments, leading to a corrected WF on axis, but generating off-axis field-dependent aberrations. In particular, a tilt on an M1 segment compensated by a tilt on the matching M2 segment will produce a field-dependent segment piston error. We will show through end-to-end Integrated Modeling simulations how off-axis wavefront measurements provided by the Acquisition Guiding and Wavefront Sensing (AGWS) unit are used to solve for this problem and guarantee a good correction over the scientific field of view ($20'' \times 20''$) only limited by atmospheric anisoplanatism.

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