Performance Evaluation of the Pyramid Wavefront Sensor for GPI 2.0

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Abstract

The Gemini Planet Imager (GPI) is a high-contrast imaging instrument designed to directly detect and characterize young, Jupiter-mass exoplanets. After six years of operation at Gemini South in Chile, the instrument is being upgraded and moved to Gemini North in Hawaii as GPI 2.0. As part of this upgrade, several improvements will be made to the adaptive optics (AO) system. This includes replacing the current Shack-Hartmann wavefront sensor (WFS) with a pyramid wavefront sensor (PWFS) and a custom EMCCD. These changes are expected to increase GPI’s sky coverage by accessing fainter targets, improving corrections on fainter stars and allowing faster and ultra-low latency operations on brighter targets. The PWFS subsystem was independently built and tested in order to verify its performance before its integration into the GPI 2.0 instrument. Here, we will present the results from these pre-integration tests, which will include assessing the throughput, pupil image quality and linearity with and without modulation of the PWFS.

Keywords: pyramid wavefront sensor, adaptive optics, gemini planet imager, atmospheric turbulence

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