

Characterization of MEMS Deformable Mirrors for Wavefront Control in Extreme Adaptive Optics

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Extreme Adaptive Optics is a new branch of Adaptive Optics (AO) that focuses on the direct imaging detection of extrasolar planets. The eXtreme Adaptive Optics Planet Imager will search for energy radiated by young planets and for debris disks. This new planet imager will increase the understanding of planetary systems and of the properties of planets. Achieving a contrast level of 10^7 is one of the main goals of ExAO in order to detect Jupiter-like extrasolar planets; this concept is at present being tested with an ultra high contrast AO testbed. Since contrast achieved by the system is related to wavefront error, wavefront control is a critical requirement for ExAO. Because the deformable mirror of the AO system is the most critical element for wavefront control, the testbed is at this time used for the characterization of a 1024-actuator MEMS (Micro-Electro-Mechanical-System) mirror using a Phase Shifting Diffraction Interferometer. The current project involves the characterization of each of the 1024 actuators in the MEMS mirror by applying varying voltages to every actuator and observing their performance. The purpose of this test is to evaluate performance of each of the actuators and see how variation in actuator response affects the overall functioning of the MEMS deformable mirror. Results will involve a discussion of the response from each of the actuators, and how this affects wavefront control.