Laboratory for Adaptive Optics

Villages

MEMS AO / ViLLaGEs

On-sky Experiments to Demonstrate Next Generation Adaptive Optics Concepts for Extremely Large Telescopes

Critical Design Review

September 8, 2006

MEMS AO/ ViLLaGEs*

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Experiment Goals:

- Demonstrate MEMS technology works on-sky under typical observatory conditions
- Demonstrate Open-loop control of MEMS
  - a key concept for MOAO
- Demonstrate laser uplink AO correction to make a small laser spot
  - a key to scaling present day laser power to LGS AO at visible wavelengths

*ViLLaGEs: Visible Light Laser Guidestar Experiments

MEMS Technology for Astronomical AO

Laboratory for Adaptive Optics

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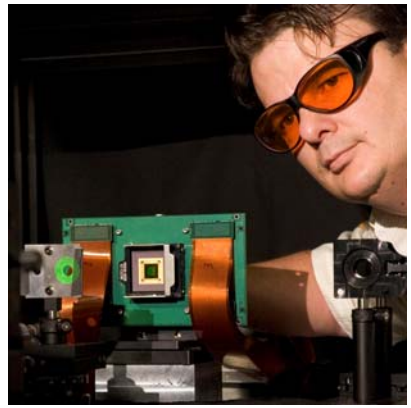
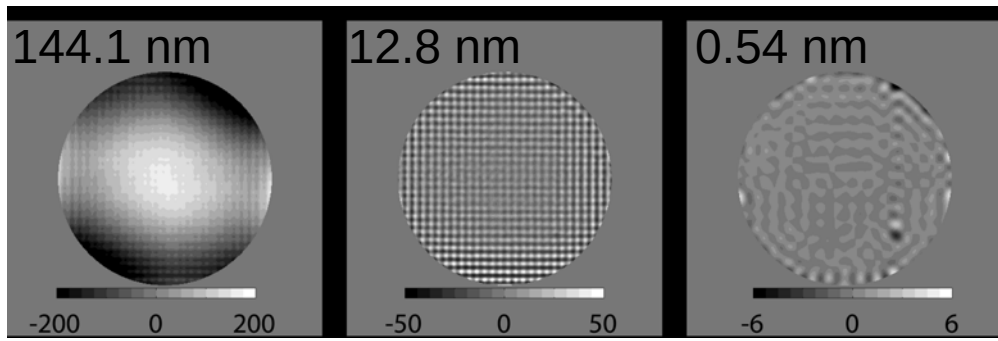
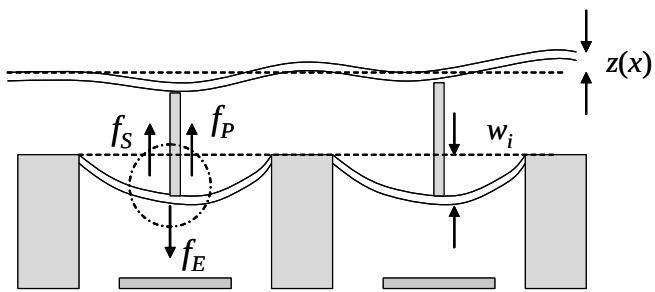
- Since 2002 the LAO has been developing and testing MEMS DMs for use in astronomical AO
- Recent results:
  - Very stable and repeatable operation (<1 nm rms)
  - Encouraging go-to accuracy using an open-loop model (<35 nm rms)





$$D\nabla^4 z(x) = f_p(x) = \sum_{i=1\ldots n} f_{p_i}(x - x_i)$$

$$f_p(z_i) = f_E(V_i, w_i) - f_s(w_i)$$



Purposes of the CDR

- This is a critical design review (CDR) for Phase 1 only (MEMS validation on-sky)
- Instructions to reviewers: Evaluate and critique:
  - Completeness of system design (mechanical, optical, electrical)
  - Response to issues raised at PDR

CDR Agenda

- Introduction and Overview - Gavel
- Optomechanical Design – Lockwood, Bauman
  - Flexure analysis
  - Temperature control/cooling design
  - Science leg design (filters, focus control, high-speed scoring camera)
- Open loop wavefront sensor performance – Gavel
- DM and Tip/Tilt stroke budgets - Gavel
- GUI design – Reinig
- Revised project schedule - Gavel