1.1. Scaling law modeling of ELT AO systems: milestones

Summer 03 Develop scaling law model of MCAO performance: laser power, number and location of laser beacons, number of DMs, wavefront sensing methods, number of degrees of freedom, site-dependent performance scaling, number of NGS, field of view. Gavel

Early fall 03 Release several “reference designs” with specific capabilities, so that astronomers can develop detailed MCAO science case, including trade-offs for field of view required. For each system: WF variance as a function of field angle. PSF vs. field angle in J, H, K. Susceptibility to time variation (e.g. what are the previous quantities as function of r_0). Both 30-m and 10-m. Ellerbroek.


Fall 03 – winter 04 Work with specific groups of astronomers to flesh out a few science programs that could be done with some of the “reference designs” – joint with GSMT Science Working Group. Max, ...

05 Refined scaling-law models and model validation via simulations. As we address key technical problems, come up with more realistic performance estimates.

1.2 Methods for dealing with laser spot elongation

Now Jerry get postdoc

03 List methods, compare as quantitatively as possible, do simulations of most hopeful methods. Marcos, unnamed postdoc, Lisa, Brent

03 Identify key laser developments that will be needed to implement the most hopeful method(s), begin discussions with potential suppliers. Payne, Telle, ...


05-07 Tests of chosen laser/wavefront sensor format at Palomar or Lick. Put a subaperture 15m away.
1.3 **Optics of laser guide star wavefront sensing (trombone etc)**

03-04 Optical designs for wavefront sensing that get rid of LGS aberrations. Dekany and Bauman

03-04 Simulations of impact of various potential solutions. Gavel.

05-07 Build prototypes of the design, test in lab

1.4 **Point Design for 30-m telescope MCAO:**

03-04 Develop and simulate fast closed-loop reconstruction algorithms and back-projection algorithms. Ellerbroek, Curt, Gilles, Don

03 Commission Palomar Multi Guide Star Unit. Do simulations, plan experiments.

04 Take data on Palomar MGSU

04-05 Analyze data from Palomar MGSU

04-05 Simulations of wavefront sensing with extended laser guide stars. Lisa, Mike, Gilles

04-06 Lab-test performance of tomography algorithms and reconstructors

03-05 Simulations and lab tests of layer-oriented vs. tomographic wavefront reconstruction. Compare notes with Europeans, develop test-cases? Marcos and friends

03-06 Develop and lab-test optimal and predictive control algorithms. Marcos and Don

03-05 Optimize wavefront sensing methods for ELTs – linearity is important. Van Dam, Poyneer, others

04 Agree on “requirements” for AO on CELT and/or GSMT

05 Conceptual design for MCAO on a 30-m telescope. Includes component simulations and hardware tests, input for down-selects=

03-05 Test wavefront reconstructors and tomography (1 DM) algorithms on Palomar
05-07 Ditto with multiple DMs

06-08 Analyze data from Gemini S. laser and MCAO system, use as input for model validation

1.5 Simulation tools:

03 Port existing Keck simulation code to parallel computer architecture – Gavel (done)

03 Parallelize Gemini simulation code on Beowulf cluster (Gemini) done

Aron

03-04 Port Gemini code to Maui High Performance Computing Center (proposal submitted) multi level parallelize

03 White paper: case study on “Lessons Learned” regarding simulation codes in international community see arroyo description for full meaning of this- basically done- see arroyo manual for white paper Gavel will assist in editing CfAO report series (technical reports)

03 Define architecture for new simulation code done this is Arroyo

03 Define modules to be written by interested groups: plan telecon for this.

03 Also need web page for simulation and modeling Gavel

03 First code release. Britton will do (on arroyo web site)

03-08 ongoing code releases periodically wavefront sensors DM’s Reconstructors Spot elongation

03-06 Document modeling methods in new code: ongoing, Britton

03-09 Code validation and lab tests

03-05 Use simulation codes for studies of MCAO performance on 30-m telescopes (see “ELT AO Point Design” above)

1.6 Experiments at Lab for Adaptive Optics and at Palomar and Lick

need a list