Adaptive Optics for the SALT

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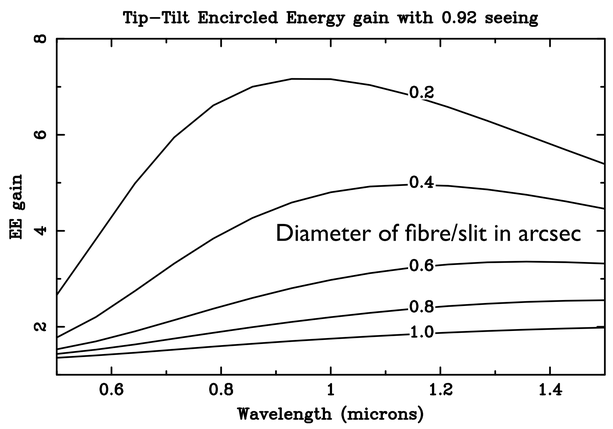
Cost-effective AO on SALT?

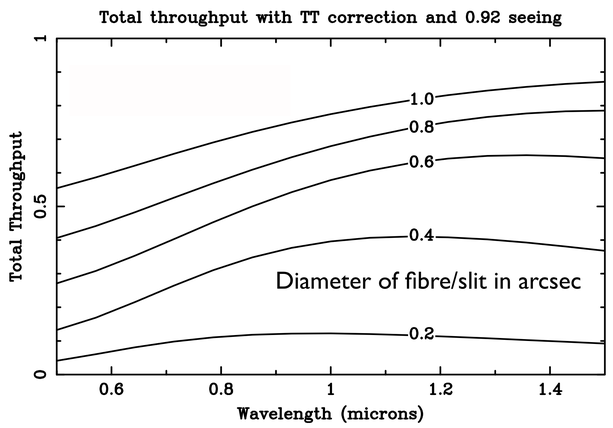
- SALT is optimized for spectroscopy and NIR imaging with limited space near prime focus area, making high Strehl whole aperture correction and Extreme AO expensive to implement.
- Choose a simpler implementation - correct for tip-tilt (and optionally focus) on each primary mirror segment - we do not attempt to phase all the mirrors together.

What gains do you get from tip-tilt?

- Median seeing is 0.92" at SALT
- Tip-tilt correction optimum for $(D/r_0) = 4$

Wavelength	r_0	D/r_0
500nm	12.0cm	8,3
800nm	18.8cm	5,3
1 micron	27.5cm	3,6



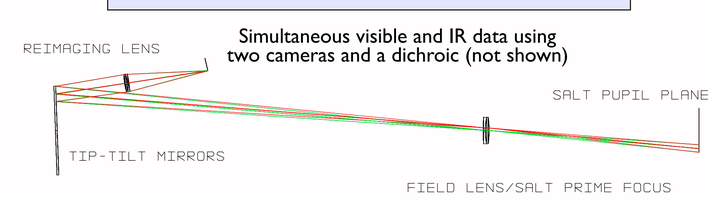


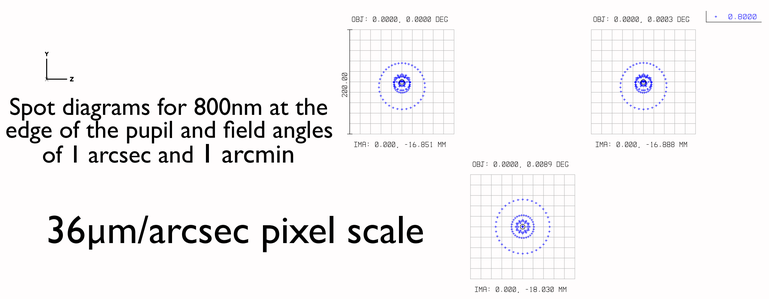
Introduction

We propose an adaptive optics system for the SALT that provides an *intermediate* wide-field level of image correction. Rapid tip-tilt correction applied to each of the 1m hexagonal mirror segments provides increased encircled energy gains from 600nm through to the near infra-red.

The AO system will also give an active optic capability (tip, tilt and focus) for all-field coverage.

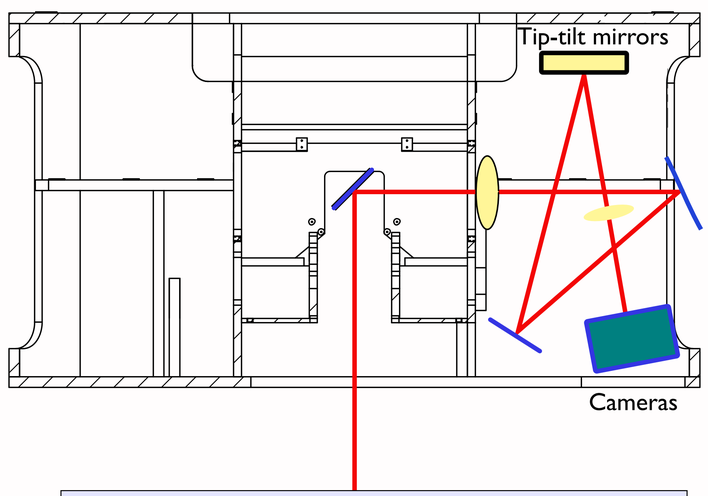
SADCAM Baseline Design





Spot diagrams for 800nm at the edge of the pupil and field angles of 1 arcsec and 1 arcmin

36μm/arcsec pixel scale



SADCAM folded in Auxillary Port

SADCAM:

SALT AO Demonstrator Camera

- Aim: to measure encircled energy gain using a til-tilt correction system on the SALT
- To characterise r_0, Θ_0 and τ_0 at visible and NIR.
- Optical and infrared 60Hz video rate cameras
- 7 element tip-tilt correction
- Fits into the Auxiliary Port

Intermediate AO Correction

- Treat SALT as 91 independent AO systems
- r_0 is well matched to 1m aperture tip-tilt
- With Natural Guide Star of m_v=16 and isoplanatic diameter Θ_0 of 2 arcminutes, up to 20% sky coverage using Natural Guide Stars.

Active Optic Capability for the SALT Primary Mirror

The sky coverage is dependent on both the isoplanatic angle and the limiting magnitude for the wavefront sensor camera. Without a suitable bright guide star, the camera rate can be slowed down and the AO system performs as an **active optics system**, sending primary mirror offset corrections every 10 to 30 seconds.

Current Status

- SADCAM development given go-ahead!
- To be put on telescope in 2009.
- Full SALT AO design study dependent on measured performance.