The CHARA Array

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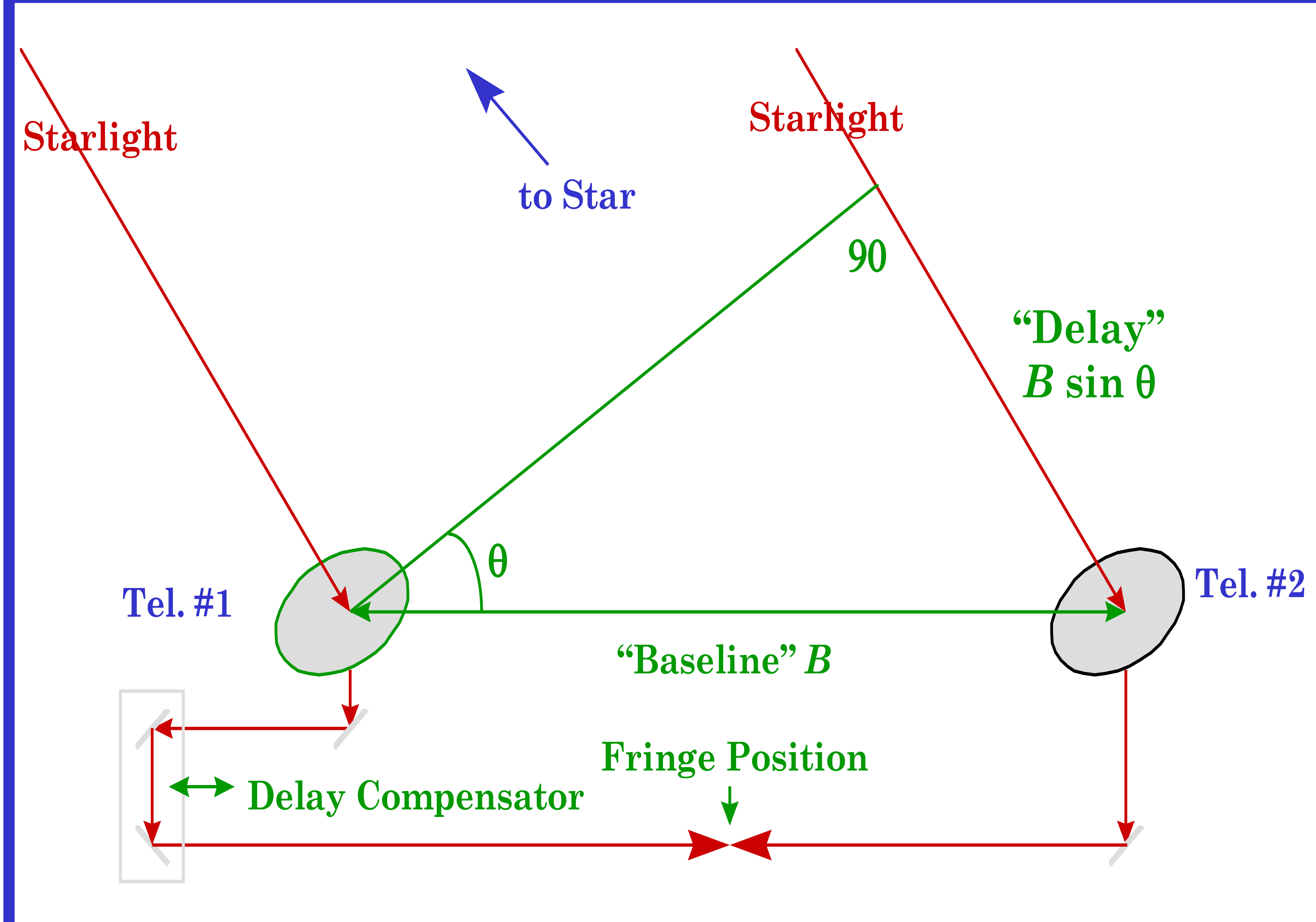
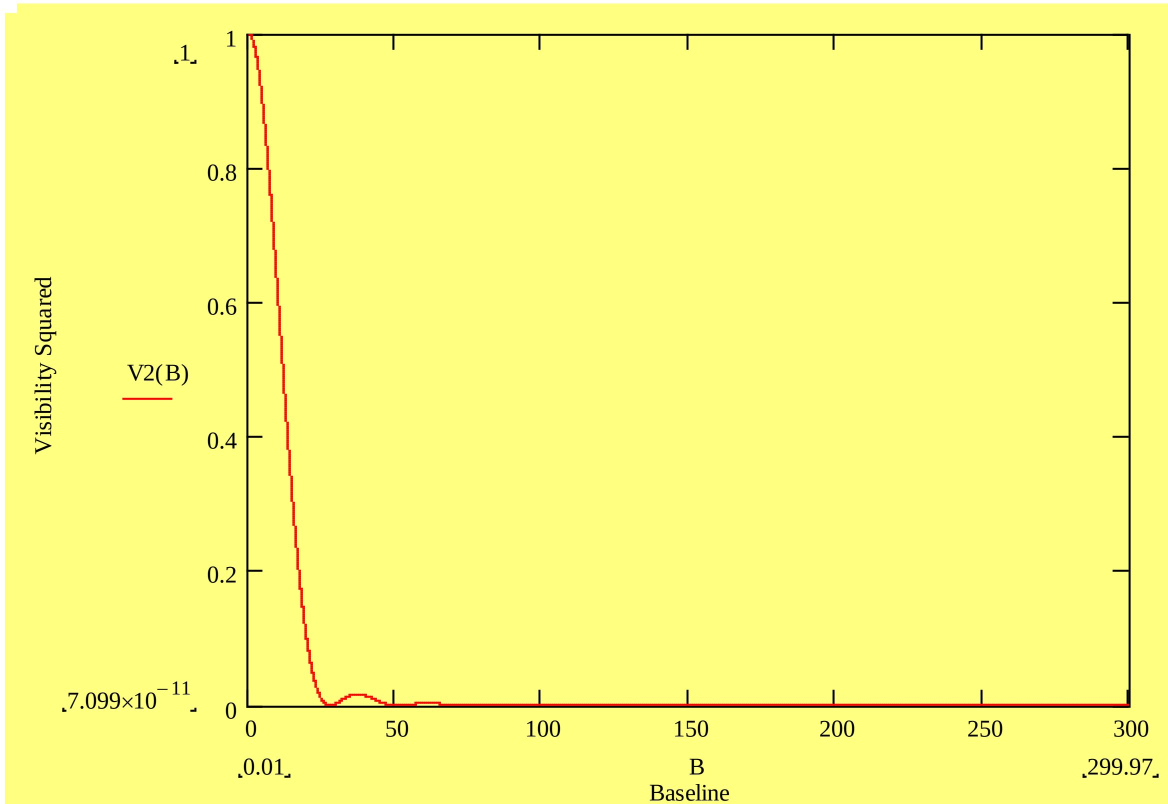
- The resolving power of a telescope increases as the telescope diameter increases.
- The light gathering power also increases with telescope diameter.
- Unfortunately the atmospheric distortion and engineering problems do too.
- We can get around some of these problem by using many smaller telescopes spread out over a large area.


Starlight
to Star
Starlight
90
"Delay"
B sin θ
θ
Tel. #1
Tel. #2
"Baseline" B
Fringe Position
Delay Compensator

Effect of Increasing Angular Diameter α

α = 1.56mas

Visibility ^{2}



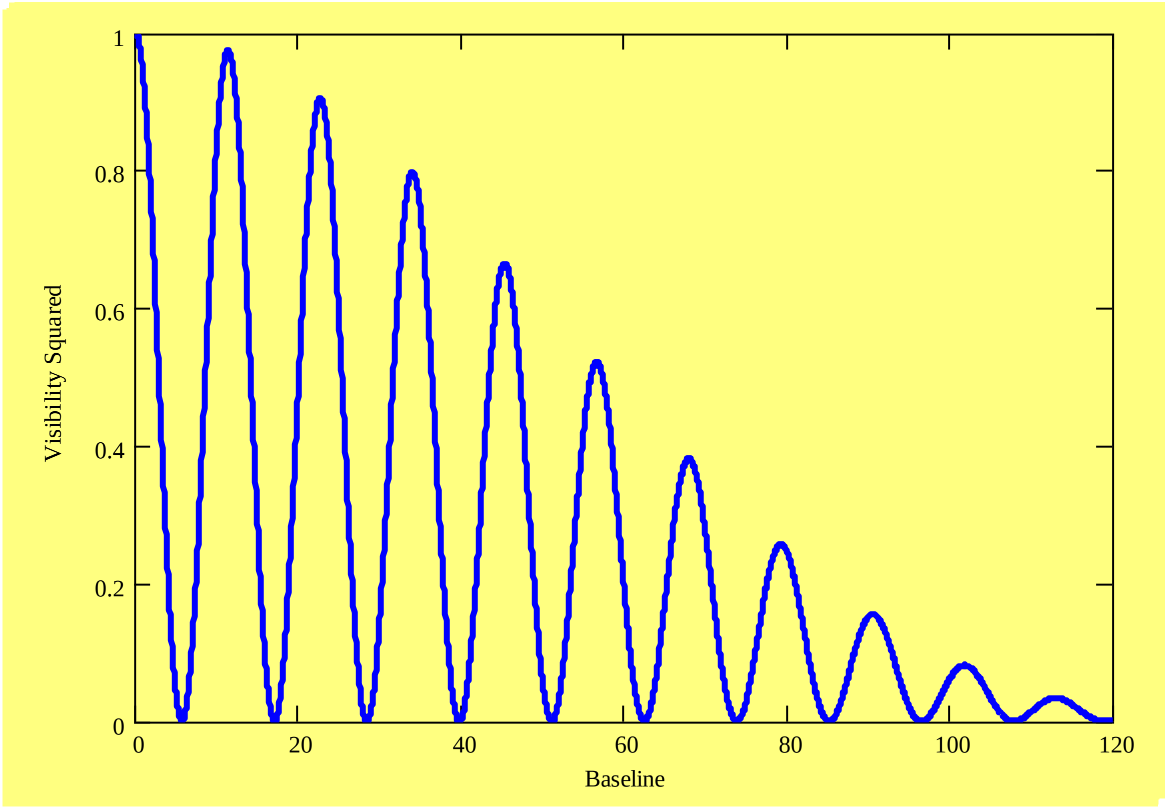
Baseline (meters)

Effect of Increasing ρ

$\alpha_1 = \alpha_2 = 1.0$ mas; $\Delta m = 0$

$\rho = 10$ mas

Visibility ^{2}

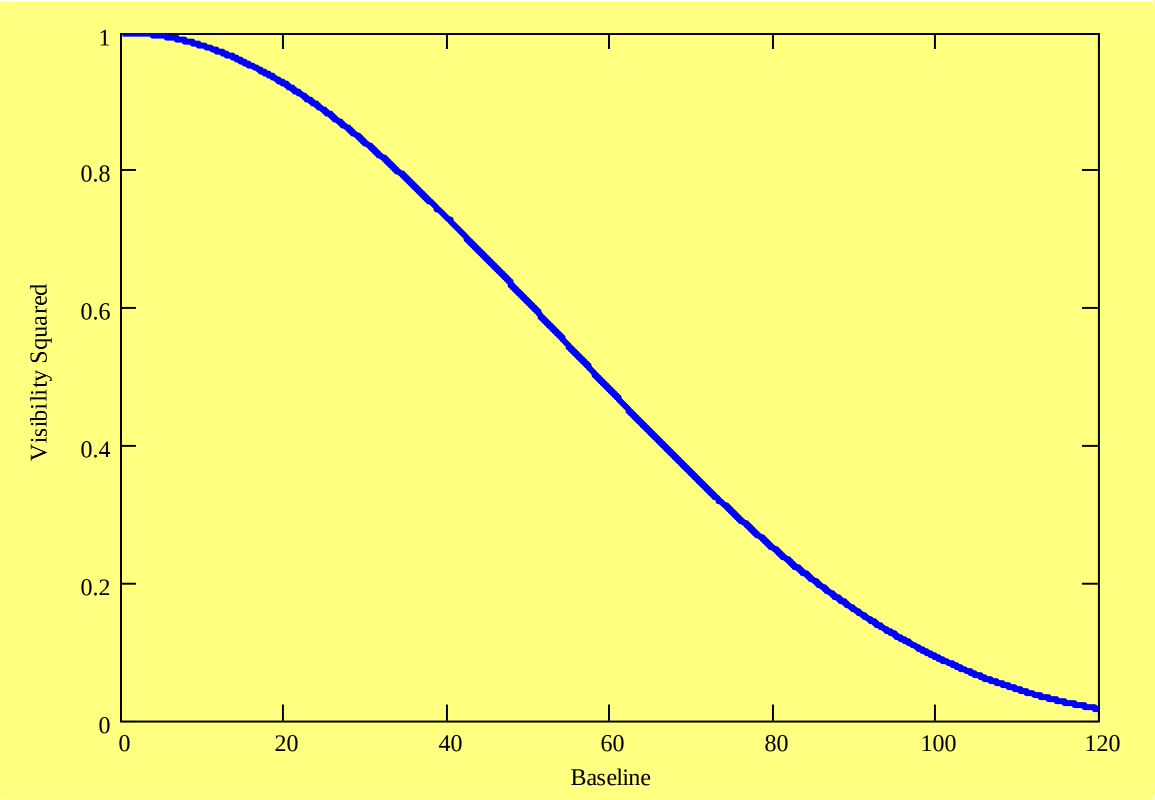


Baseline (meters)

Effect of Increasing Δm

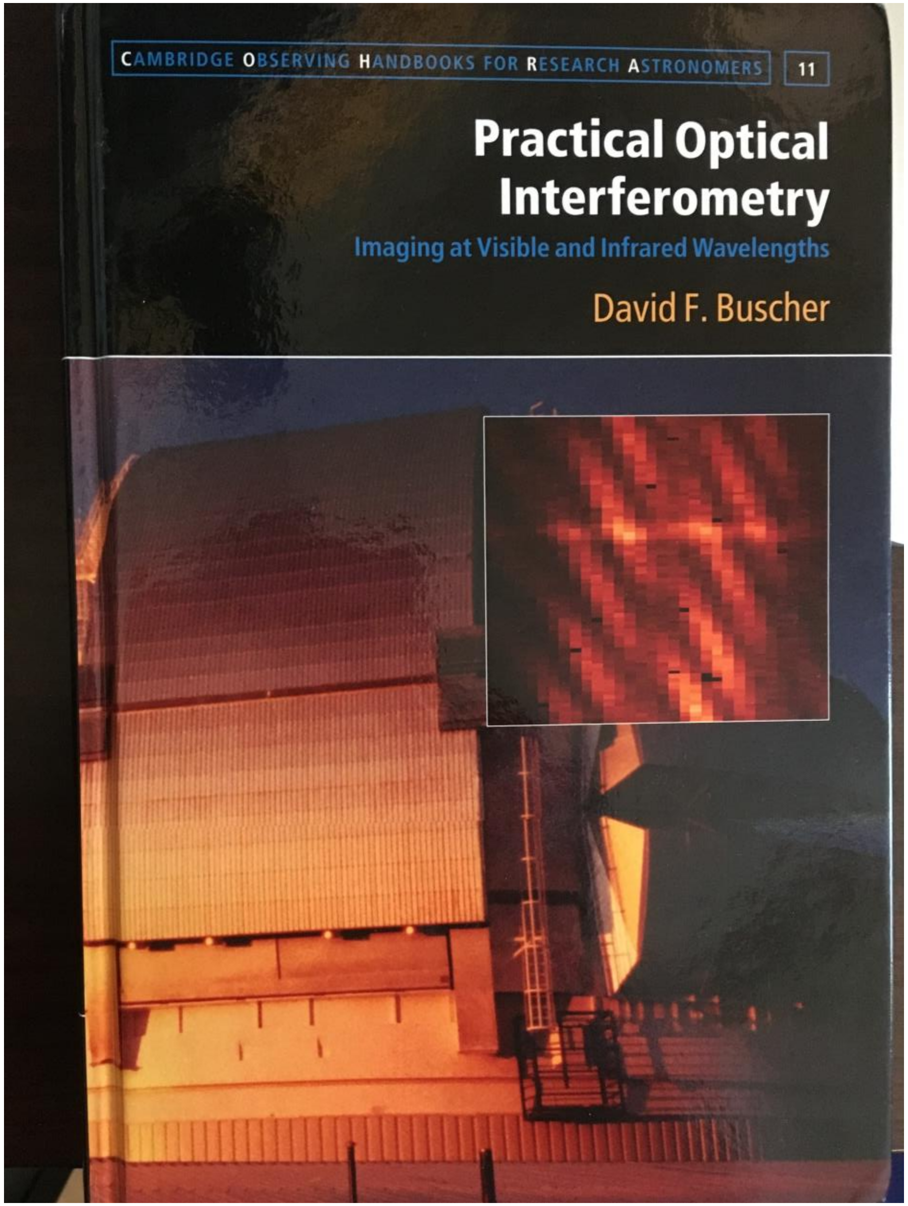
$\alpha_1 = \alpha_2 = 1.0$ mas; $\rho = 2.5$ mas   **$\Delta m = 10$**

Visibility



Baseline (meters)

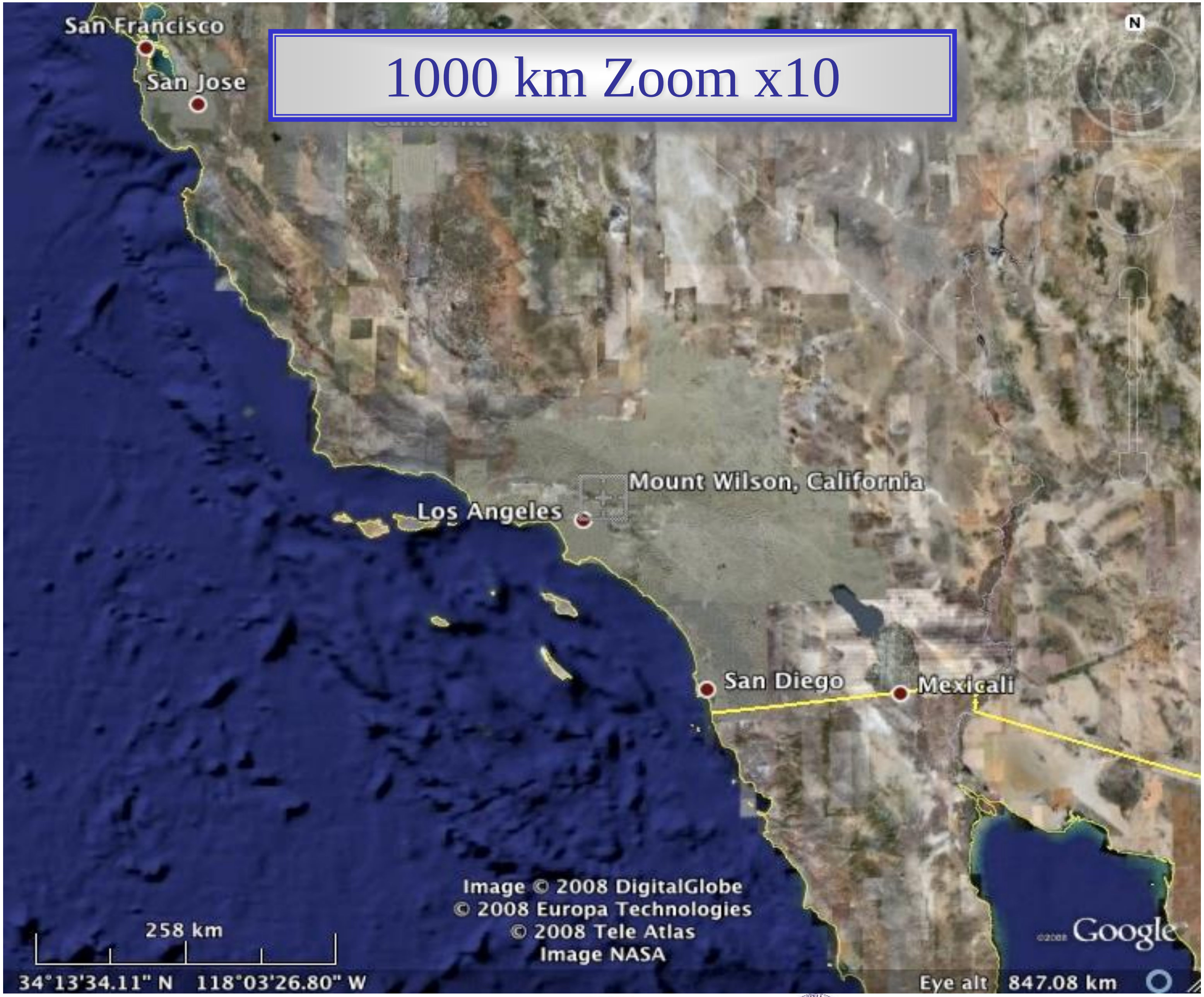
Georgia State University
NSF
NOAO
l'Observatoire de Paris
LESIA
NExScI
SUSI
Observatoire de la Côte d'Azur
University of Exeter


CAMBRIDGE OBSERVING HANDBOOKS FOR RESEARCH ASTRONOMERS
11
Practical Optical Interferometry
Imaging at Visible and Infrared Wavelengths
David F. Buscher

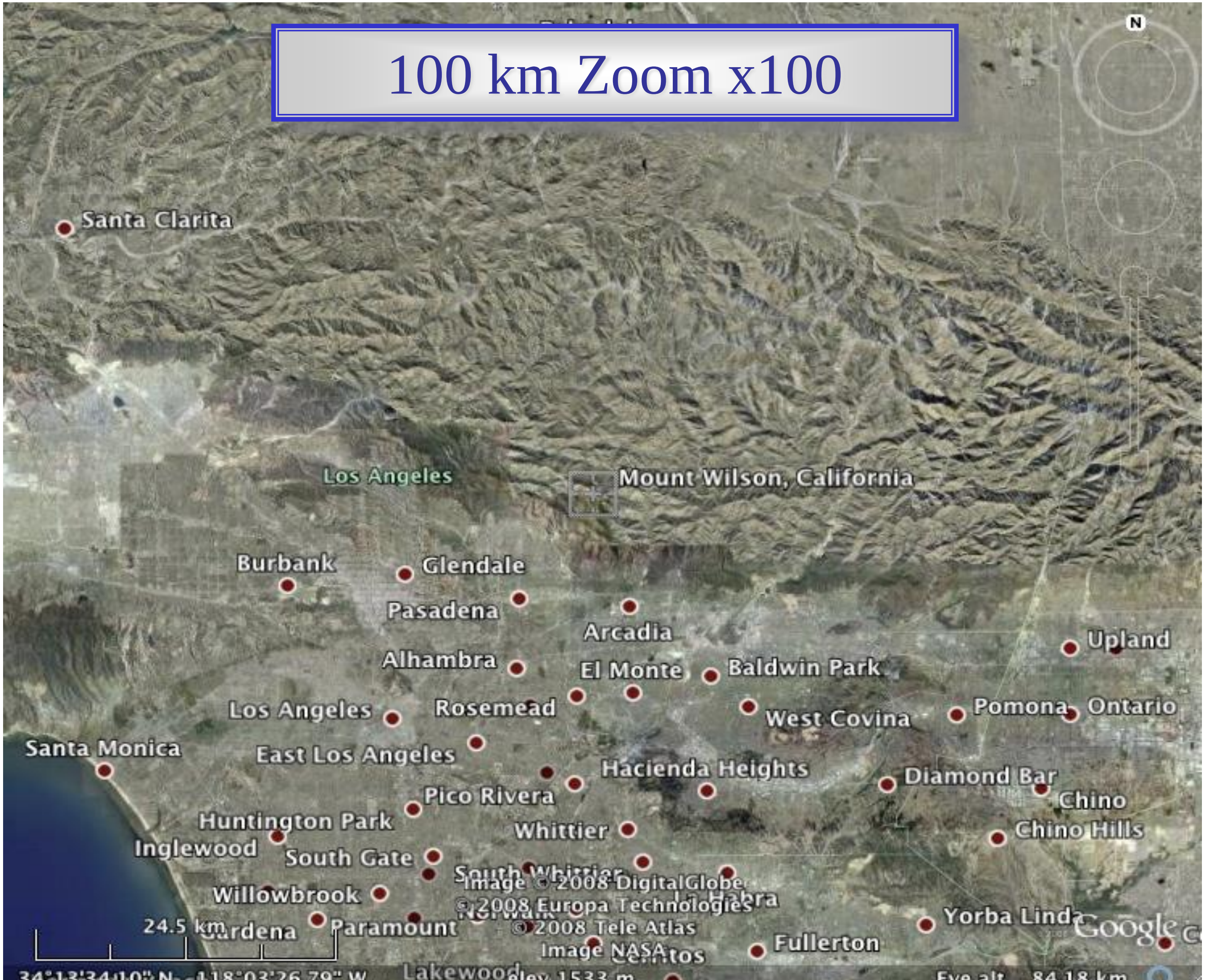
10000 km

VLBA spans the Earth and has the highest angular resolution of any observatory

1000 km Zoom x10



100 km Zoom x100

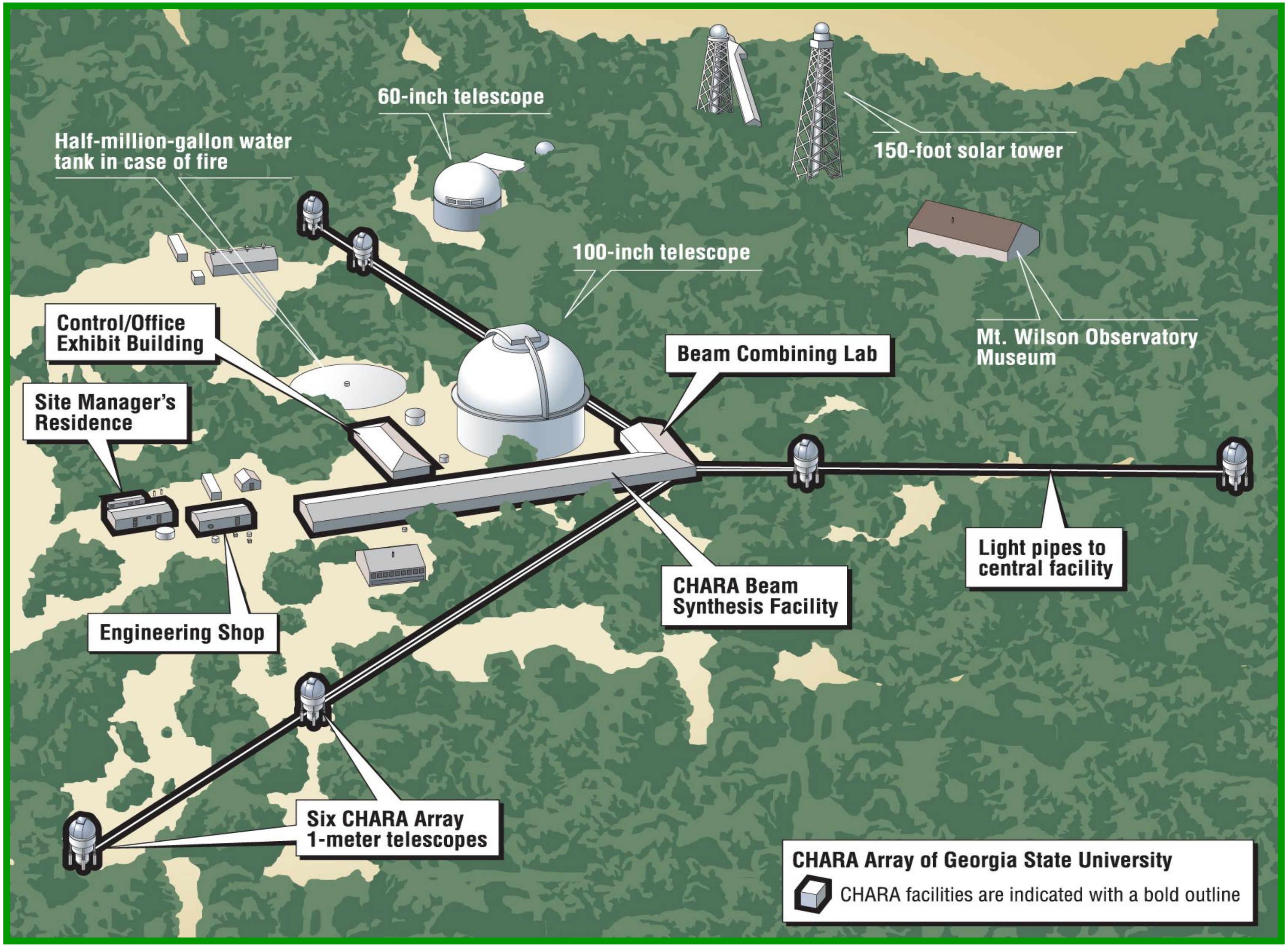


10 km Zoom x1000

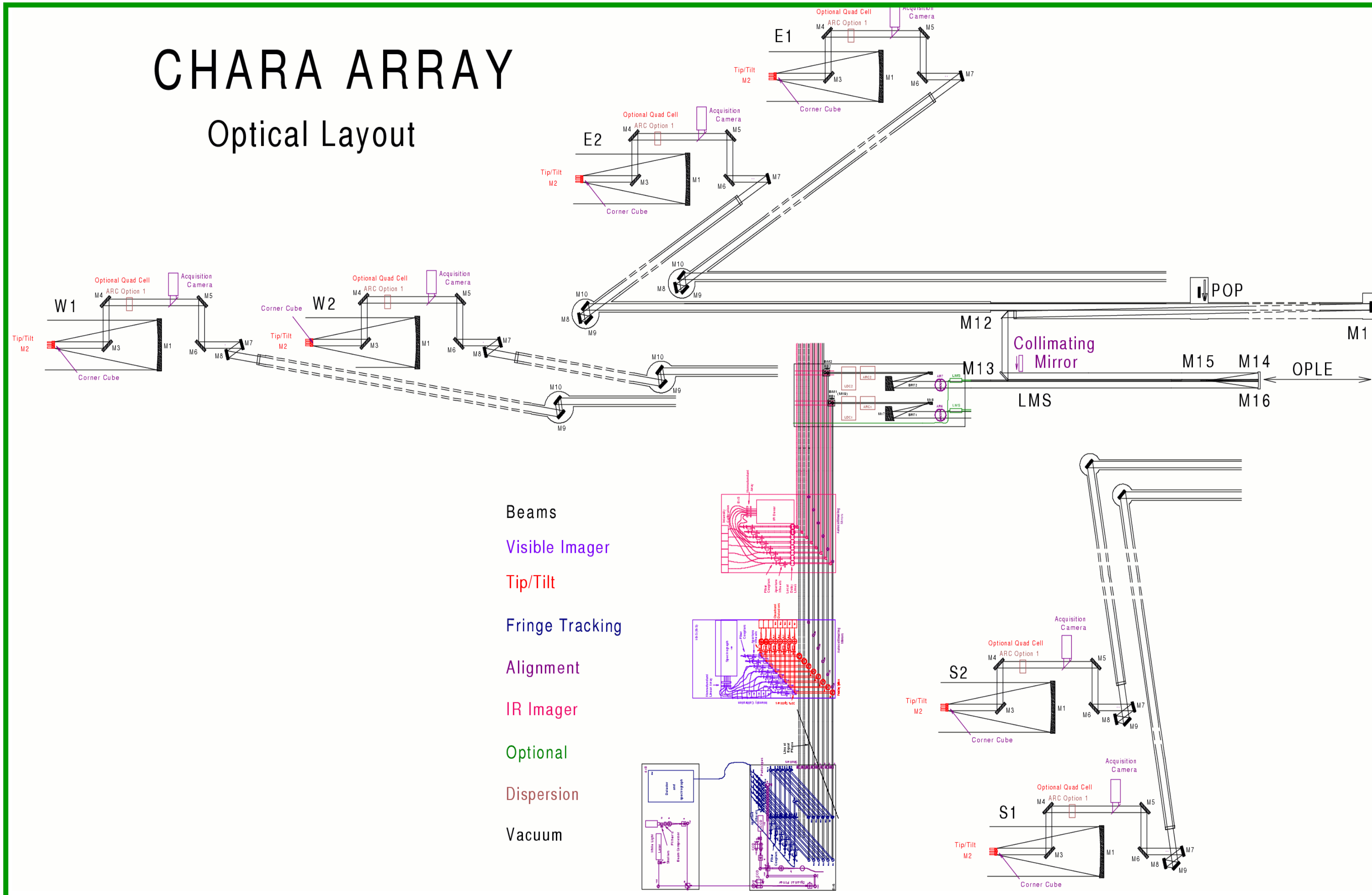
1 km Zoom x10000

By using NIR and Visible light instead of radio waves, we can achieve the same angular resolution as VLBA but with a much smaller interferometer

Layout of the CHARA Array



Overall Optical Layout



Telescopes

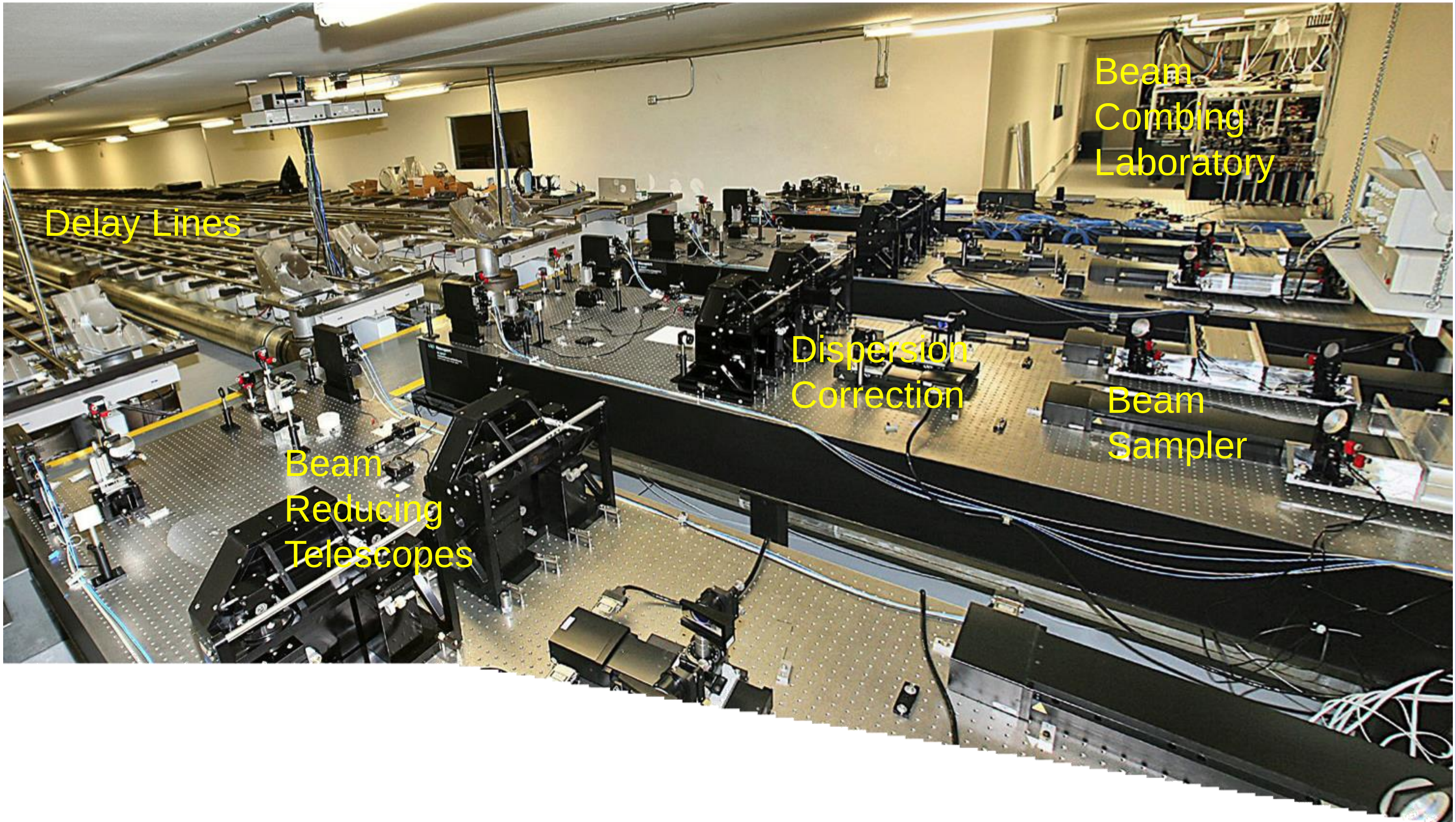
~6 ft

CAD by Laszlo St...

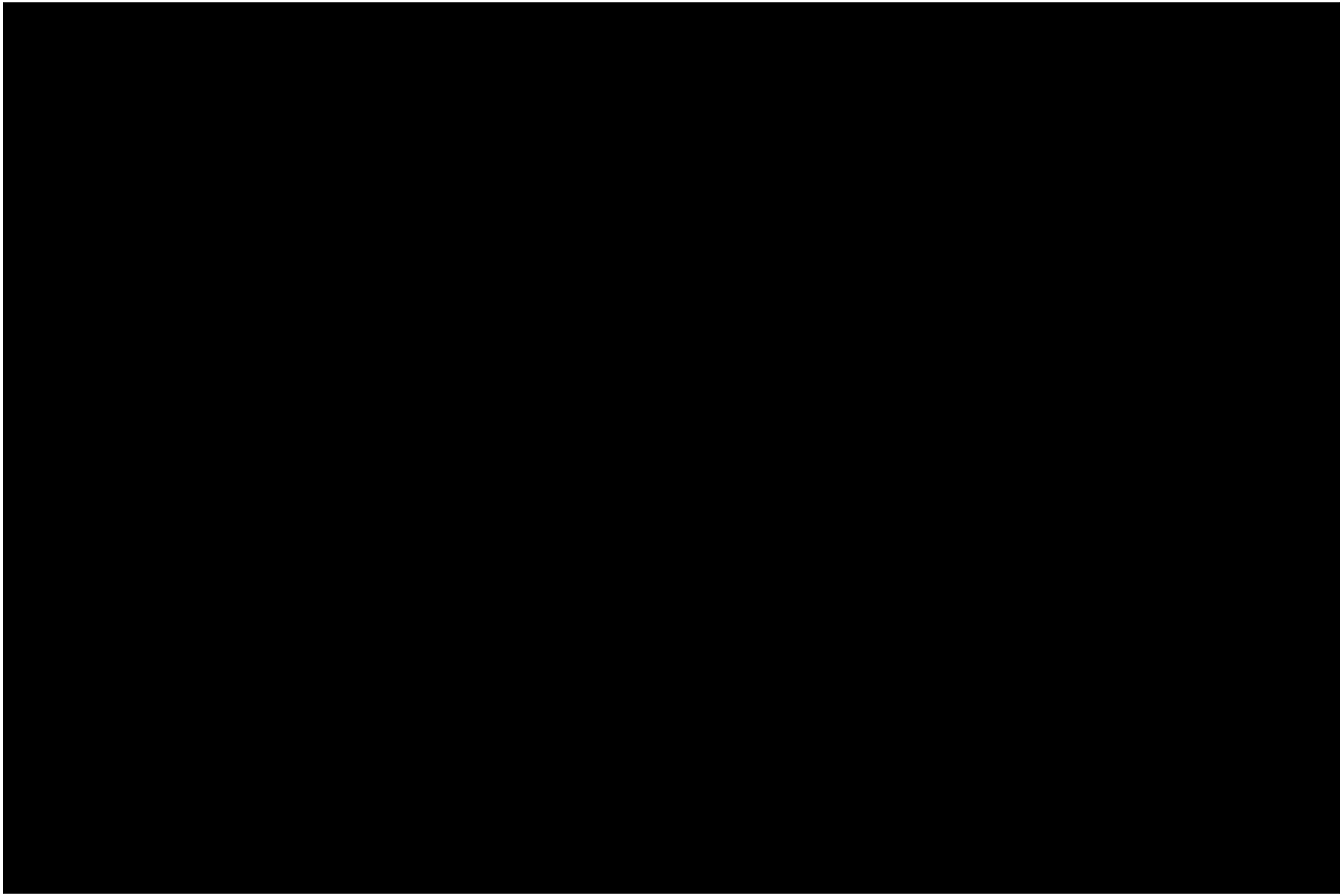
Photo by Steve Golden

Vacuum Light Tubes Feed Light from Each Telescope to the Central Lab

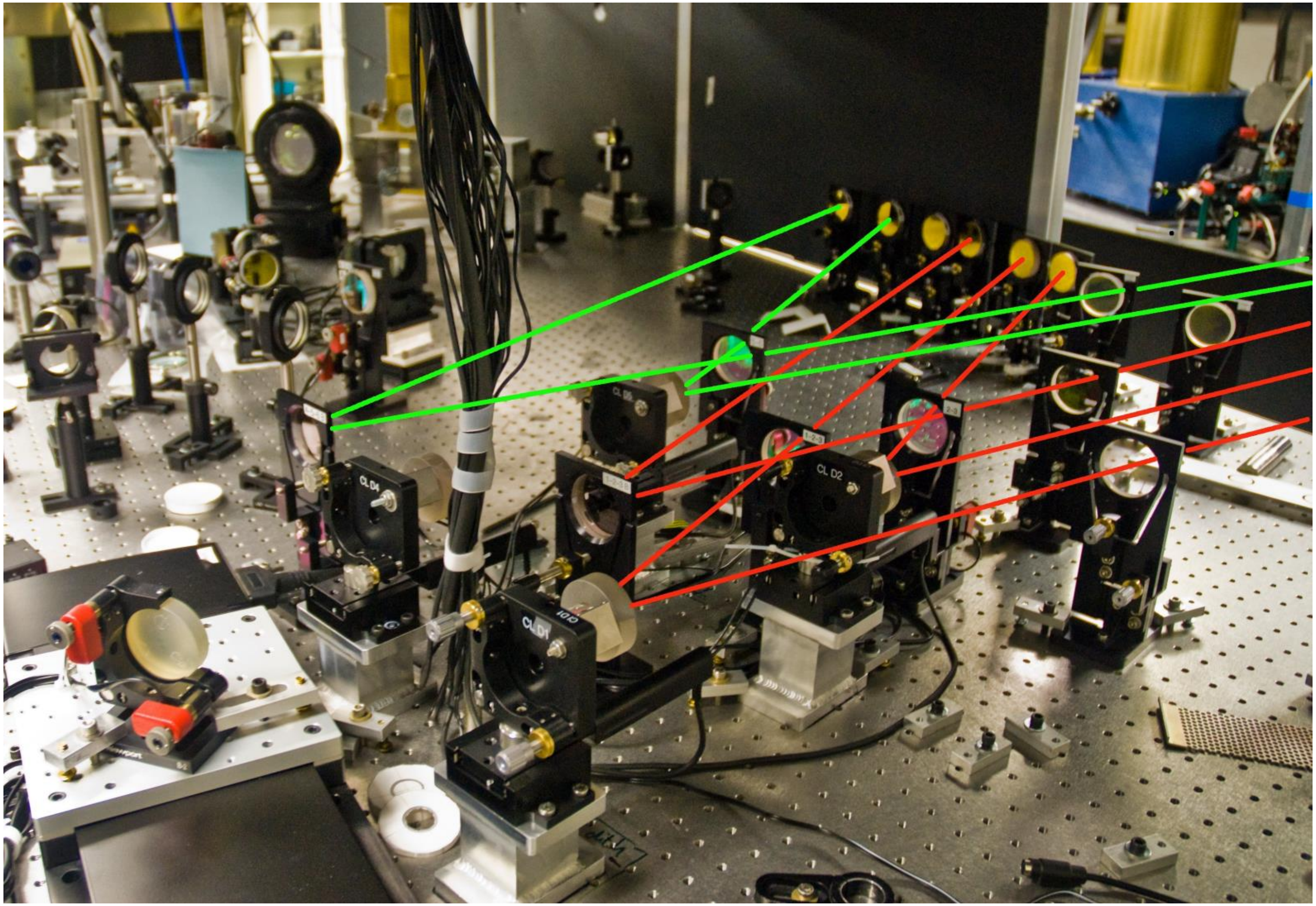
Optics Laboratory



The 30 second CHARA tour.

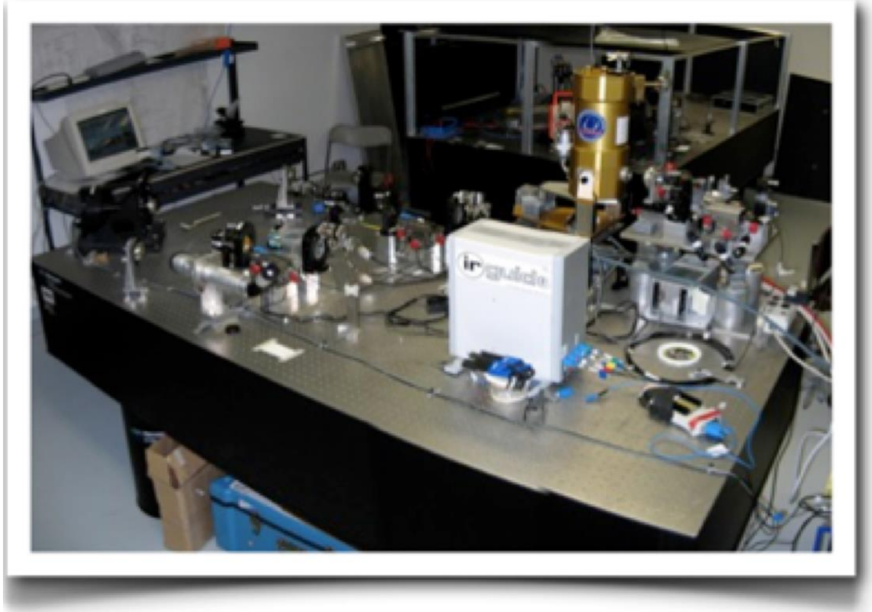


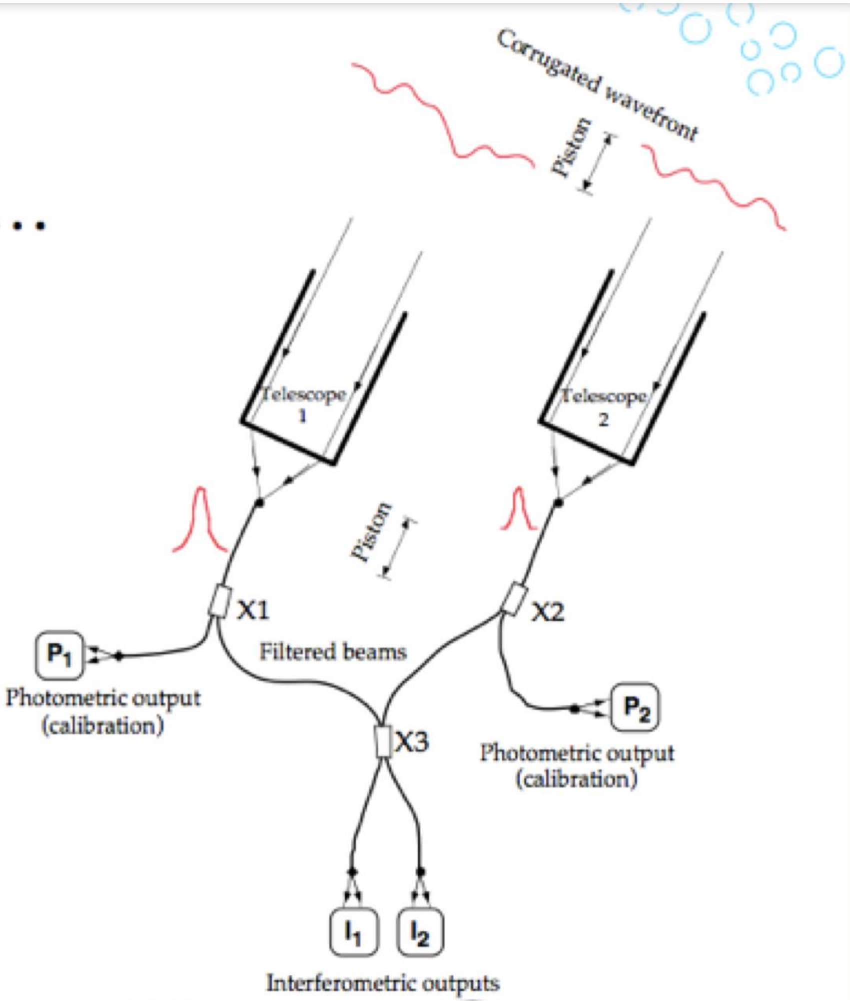
CLIMB: CLassic Interferometry on Multiple Baselines



FLUOR: Fiber Linked Unit for Optical Recombination

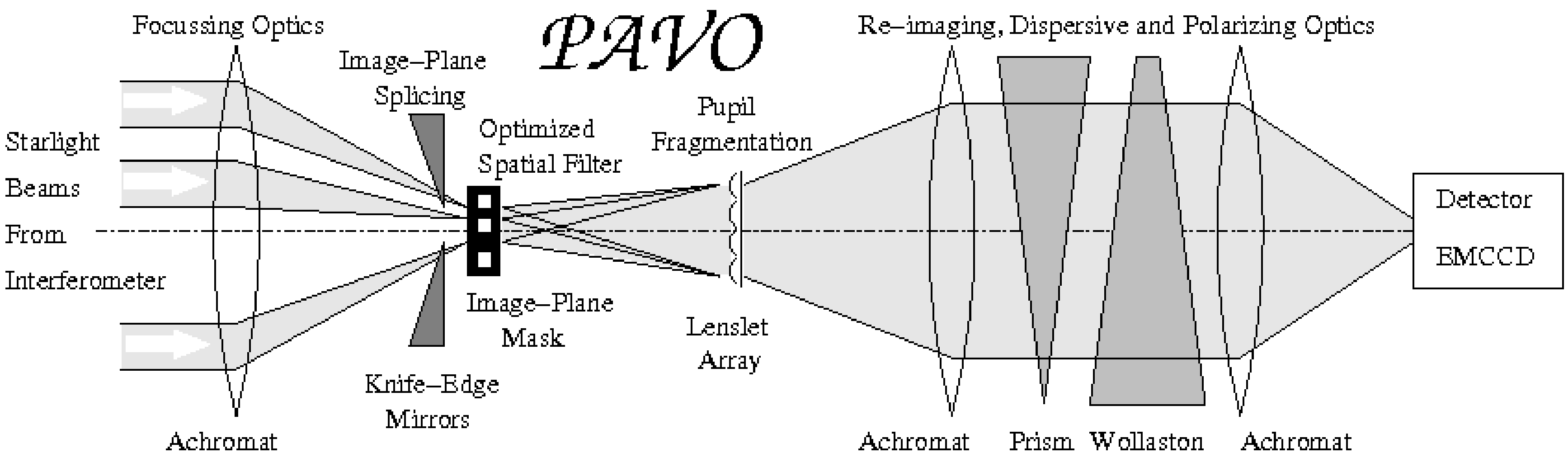
- High accuracy V^2 science
  - –Two telescopes so no phase…
  - –Broad K band (so far)





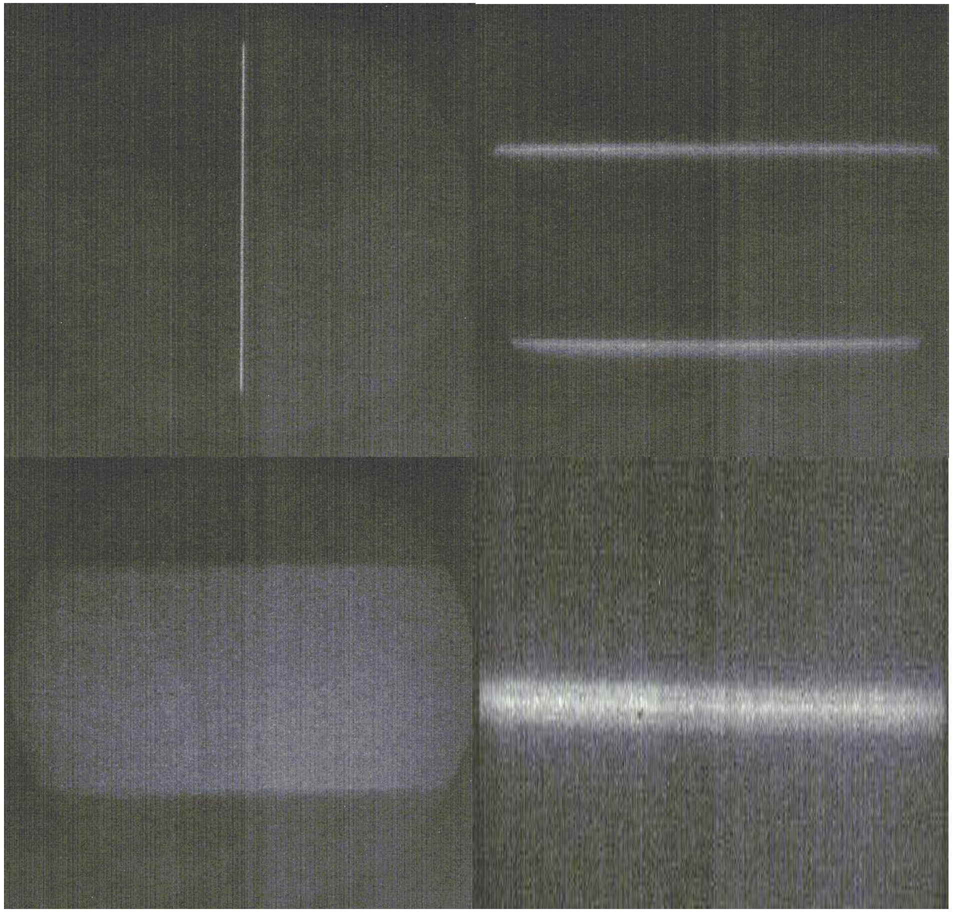
What is PAVO (besides Spanish for Turkey) ?

- PAVO is an integral-field-unit for measuring spatially-modulated pupil-plane fringes.
- PAVO combines three beams for closure phase and has the highest sensitivity of all instruments in the visible wavebands.
- PAVO has been completed at CHARA and, weather pending, will be comissioned at SUSI next week.



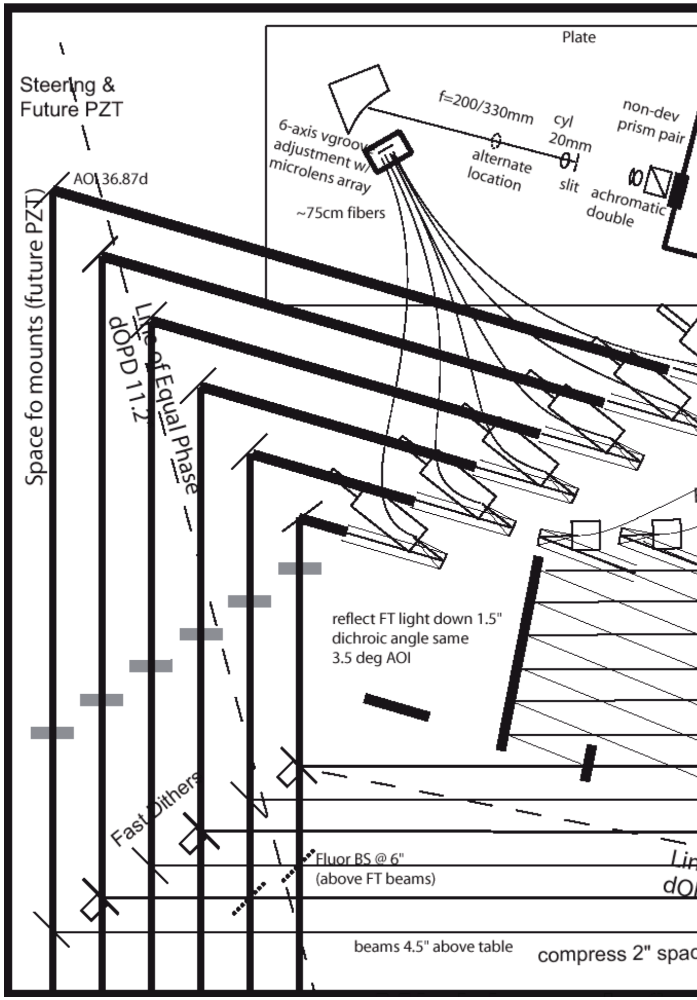
VEGA: Visible spEctroGraph and polArimeter

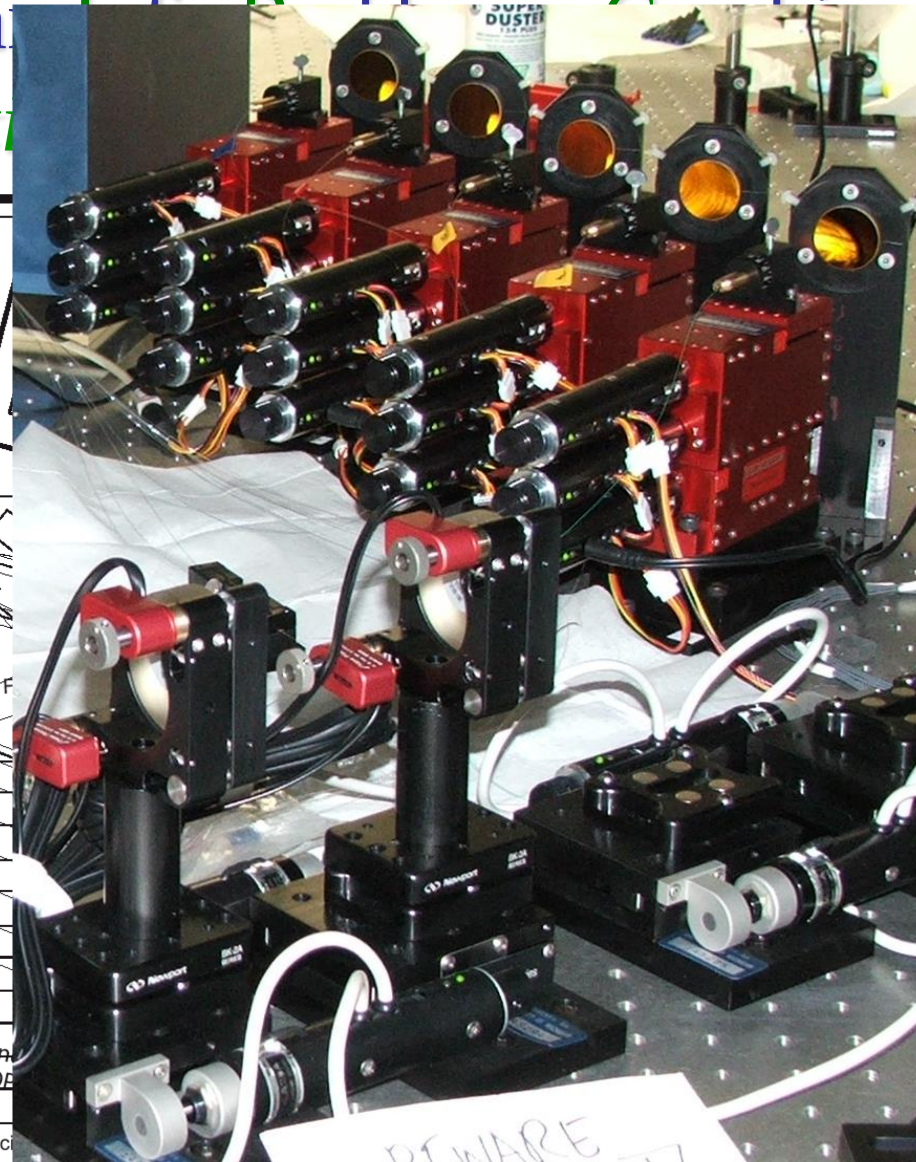
- Highest spectral resolution in the visible (R=30000).
- Combines up to four beams
- Uses a combination of Single Slit Spectroscopy, Speckle Interferometry and "Real" Interferometry.



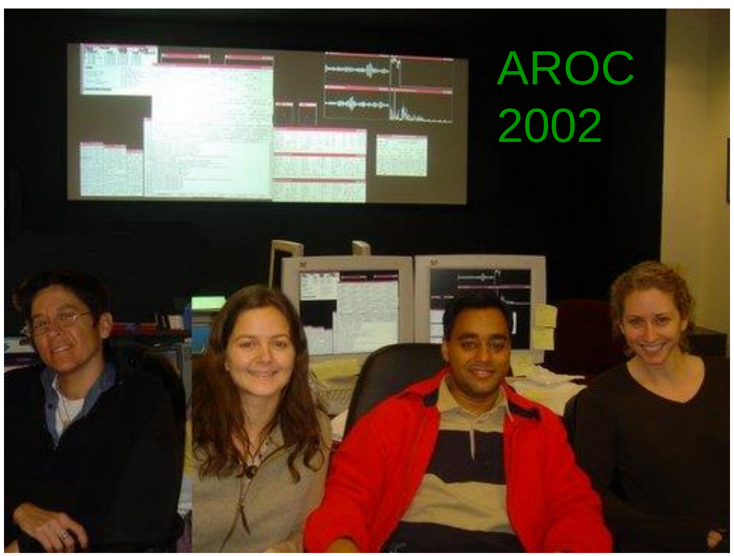
MIRC: Michigan

Mak

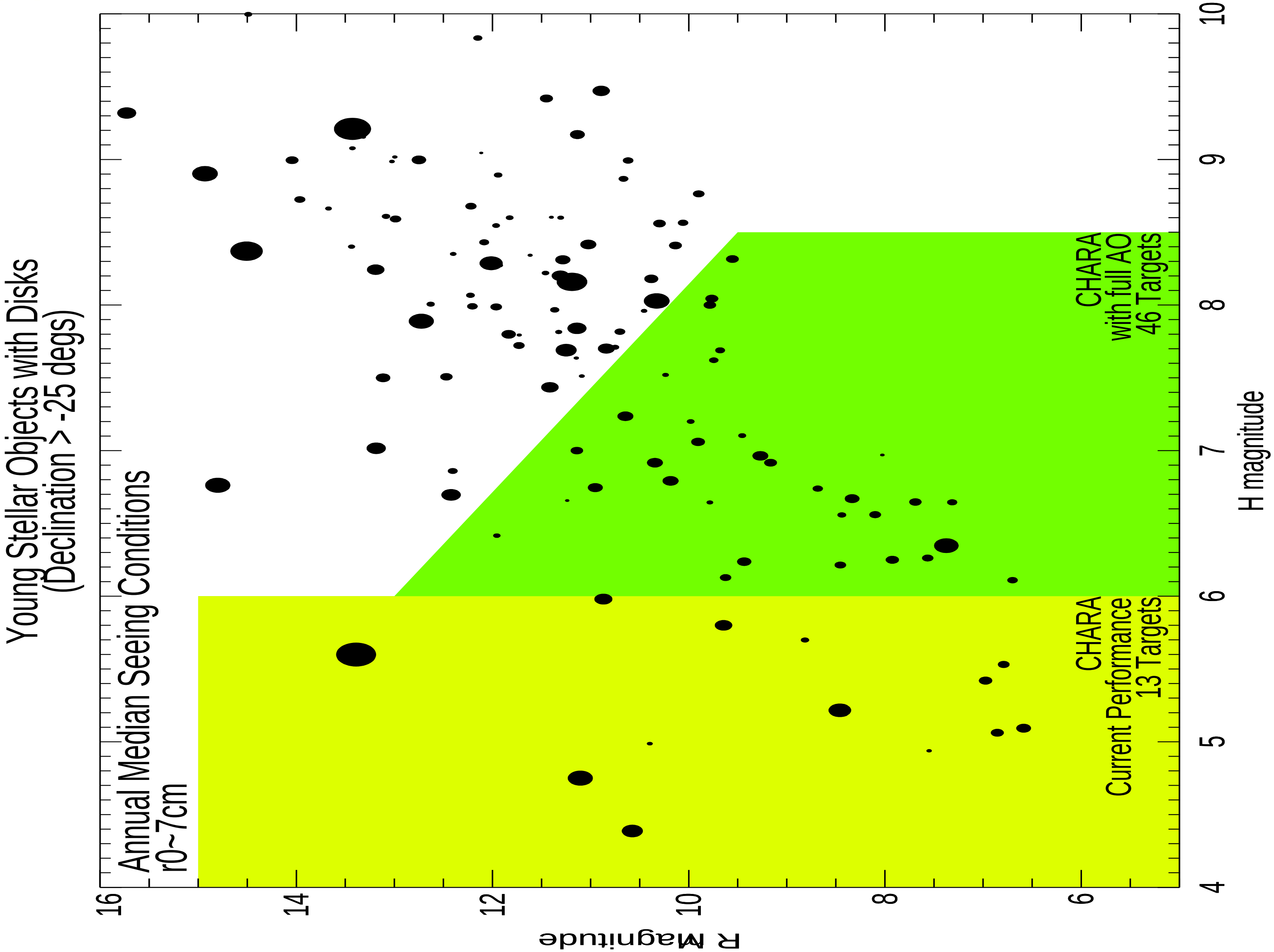




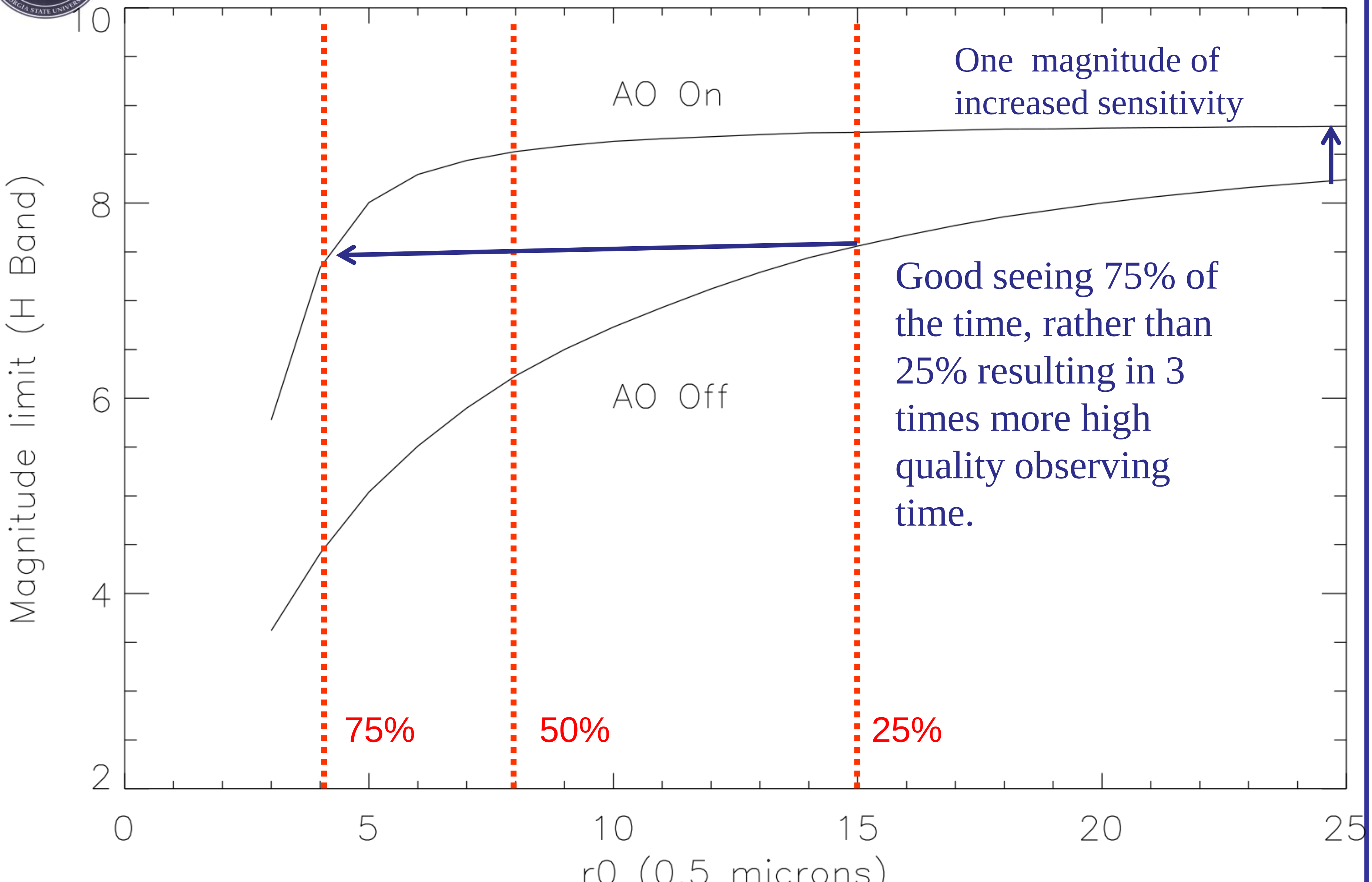
ROCMI
2006



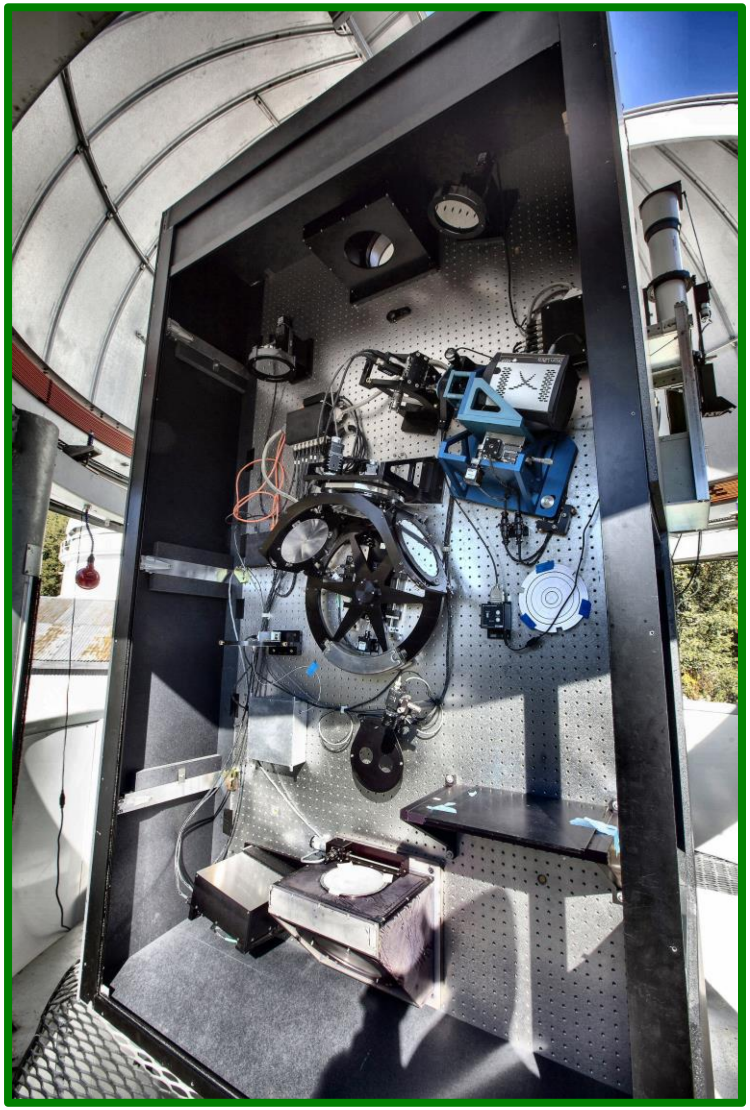
CHARA-AO Program – New Capabilities

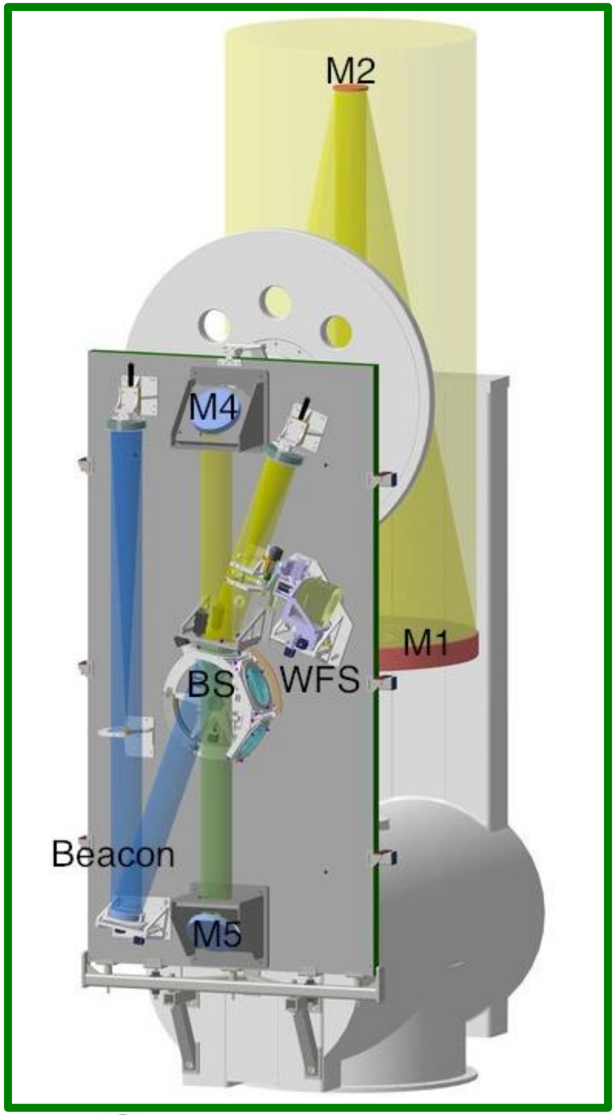


The Phase II Money Plot…

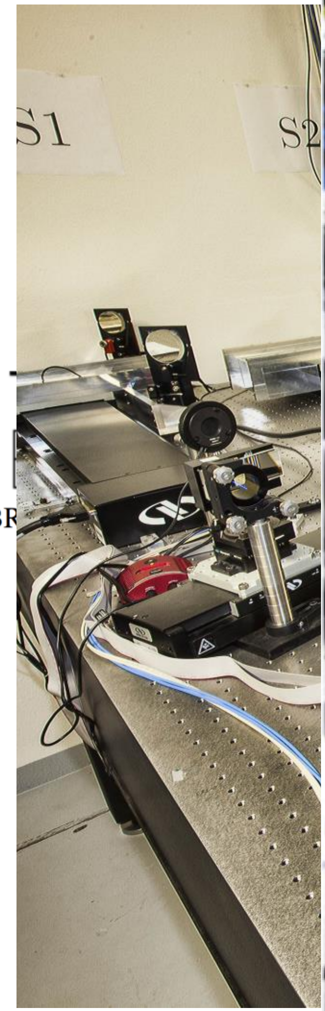


CHARA-AO Phase I: Telescopes

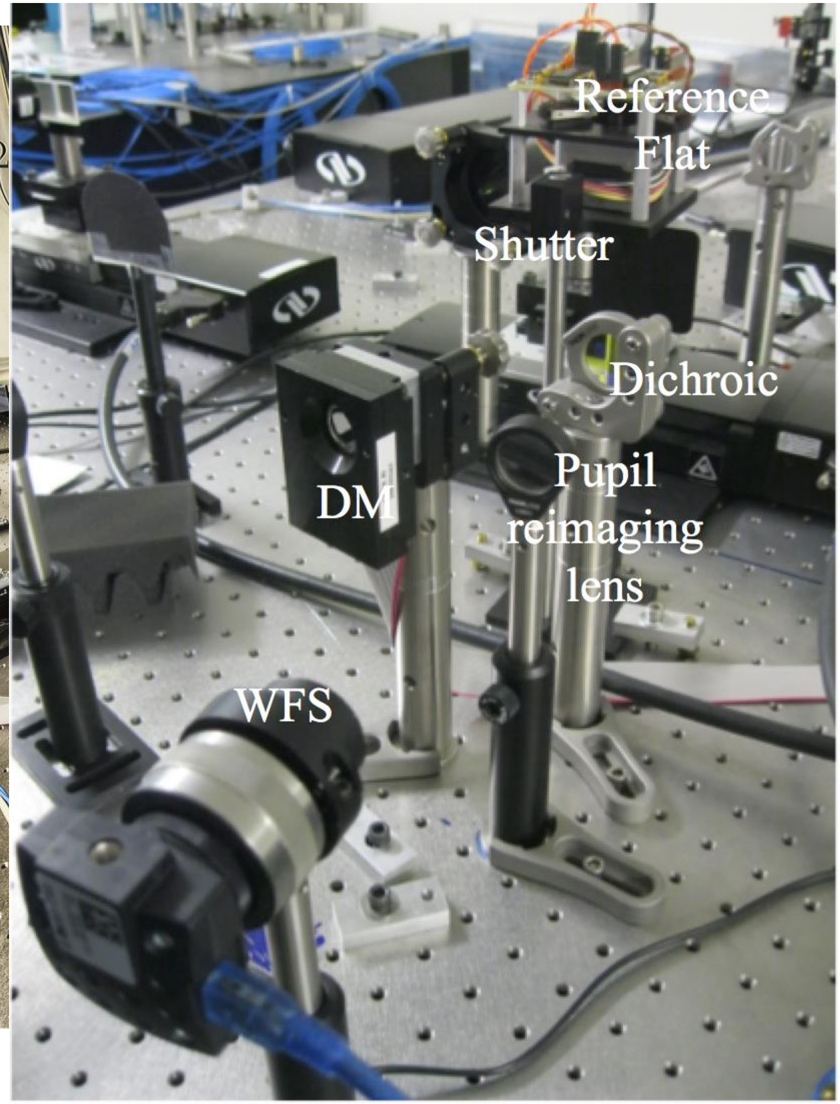


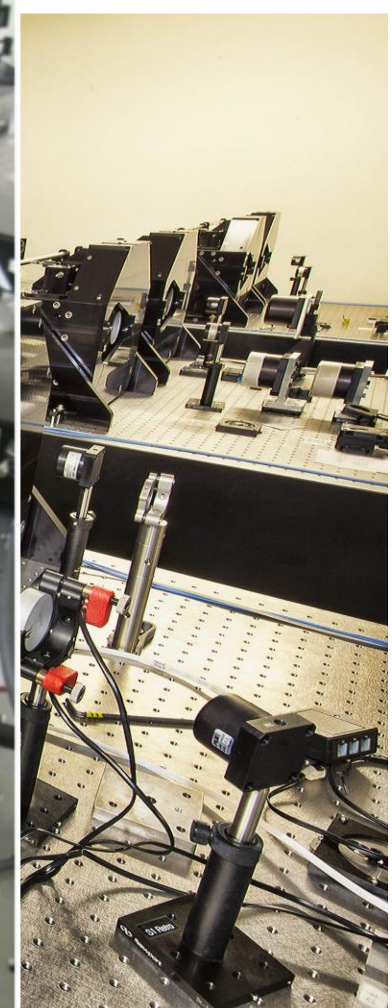


CHARA-AO Phase I: LABAO

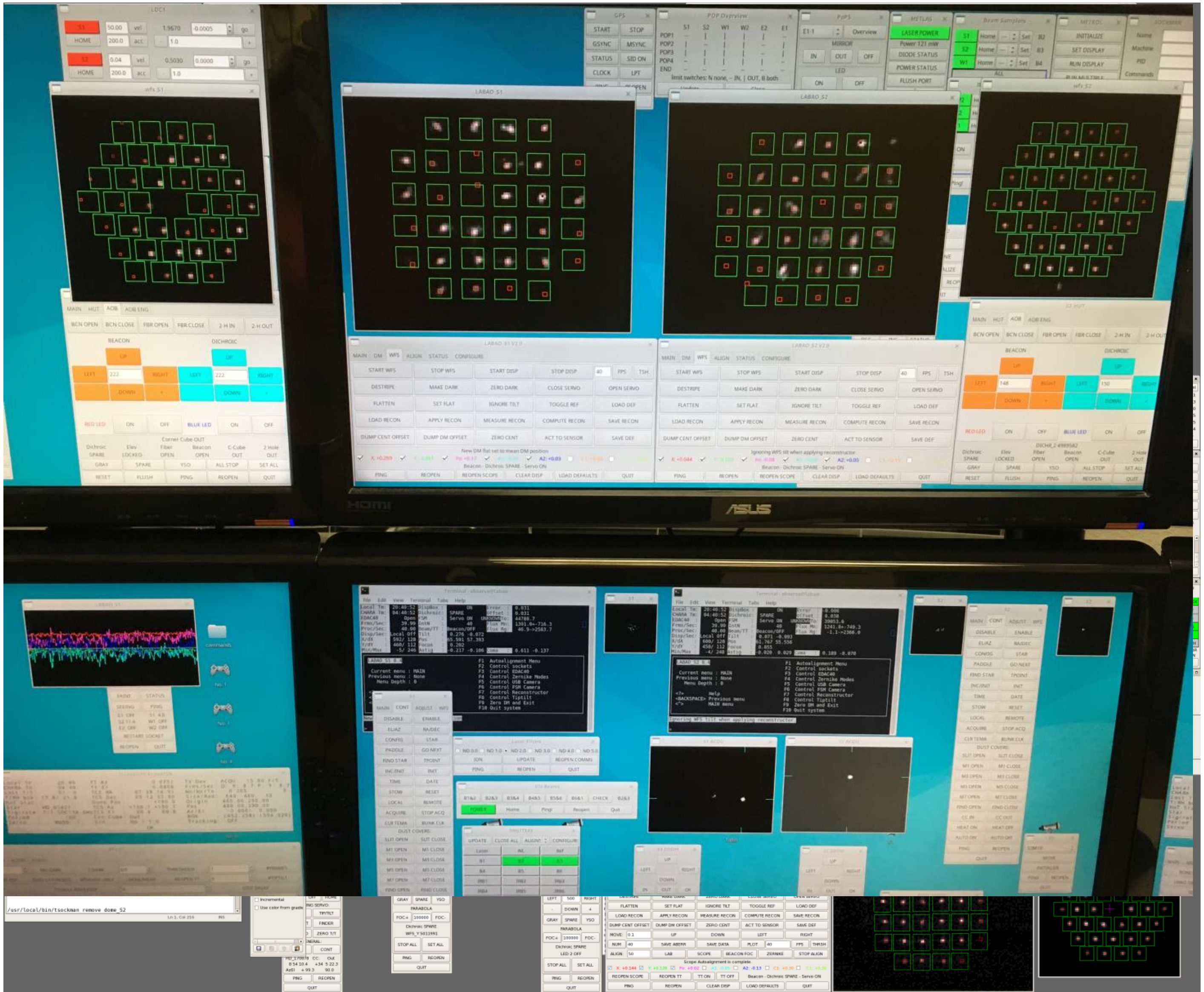


BR

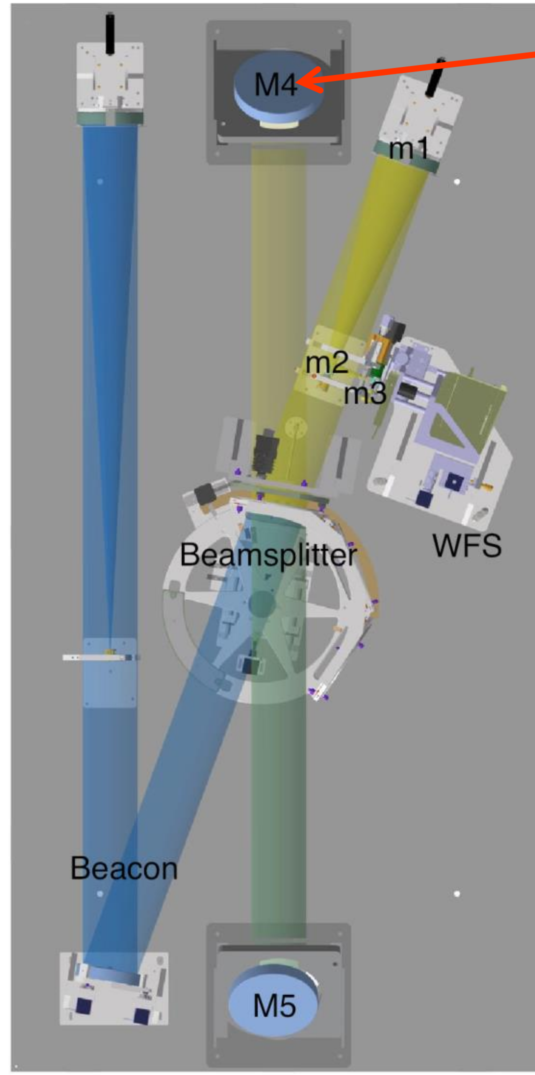




CHARA-AO Control

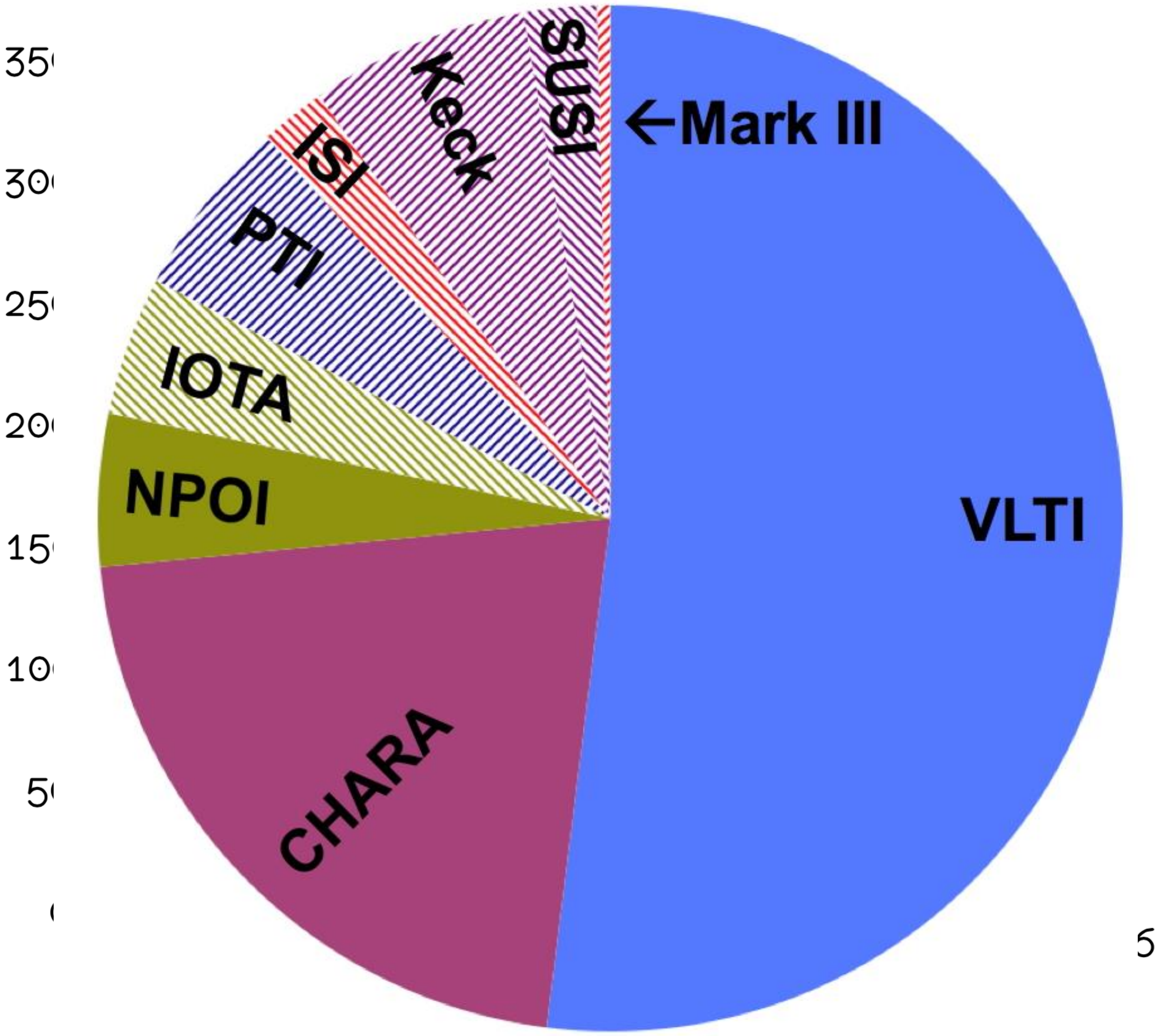


CHARA-AO Phase II: Telescopes



Phase II funds replacing M4 with a deformable mirror at each telescope. This will enable us to correct for atmospheric seeing and increase scientific throughput.

The U.S. lags Europe in access to, support of, and education about OIR Interferometry



NOAO Observing : https://www.noao.edu/gateway/chara/

Mode	Telescopes	Band	Typical limit Mag=	Best performance Mag=	At Spectral Resolution R=
Acquisition	6	V-R	10.0	12.0	Broad band
Tilt tracking	6	V-R	10.0	12.0	Broad band
CLASSIC	2	H or K band	7.0	8.5	Broad band
CLIMB	3	H or K band	6.0	7.0	Broad band
JouFLU	2	K	4.5	5	Broad band
MIRC	6	H	4	6	42
PAVO	2	630-900 nm	7.0	8.0	30
VEGA (hi-res)	2 or 3	2 bands of 7nm (separation 30nm) in 480-850nm	4.0	5.0	30000
VEGA (med-res)	2 or 3	2 bands of 35nm (separation 160nm) in 480-850nm	6.5	7.5	6000

More exciting times are ahead….