NOI Update

29 February 2012

Don Hutter

NOI Update

The "BASICS"

- NOI = Navy Optical Interferometer (formerly NPOI)

- Major funding by Oceanographer of the Navy and Office of Naval Research

- NOI is collaboration b/w USNO & NRL, in association with Lowell Observatory

- Lowell is science partner & contractor to USNO (infrastructure & ops)

NOI Update

The NOI Team:

USNO:

Ken Johnston
Paul Shankland
Don Hutter
Jim Benson
Mike DiVittorio
Bob Zavala

AZ Embedded Sys:

Tim Buschmann
David Allen

NRL:

Richard Bevilacqua
Tom Wilson
Tom Armstrong
Jonathan Andrews
Ellyn Baines
Jim Clark
Bob Hindsley
Sergio Restaino
Henrique Schmitt

TSU:

Matt Muterspaugh
Askari Ghasempour
Mike Williamson

Lowell:

Jeff Hall
Gerard van Belle
Caryn Fitch
Floyd Drinkard
Joel Dugdale
Lisa Foley
Jason Sanborn
Susan Strosahl
Steve Winchester
Ron Winner

NMT:

Anders Jorgensen

NOI Update

Current Capabilities:

- Simultaneous, group-delay fringe tracking on multiple baselines (6 stations)

- Bandpass 550-850nm in 16 channels (R ~ 30-50)

- Single-baseline fringe tracking to m_v = 6.7

- Multi-baseline fringe tracking w/closure phase to m_v = 6.0

- Operated by one observer, scheduled ~355 nights/year

NOI Update

Upgrades in Progress:

- **1.8 m telescopes:**

  – Nov 2010: gifted to Navy (USNO Flagstaff) by CARA

  – Special Use Permit expected from US Forest Service ~ April 2012

  – Infrastructure plans finished ~ April 2012

  – Navy funding (FY12/13) at $9.88M "95% certain" for mid-2012 construction start

  – FY14/15 funding "at several $M" has good prospects
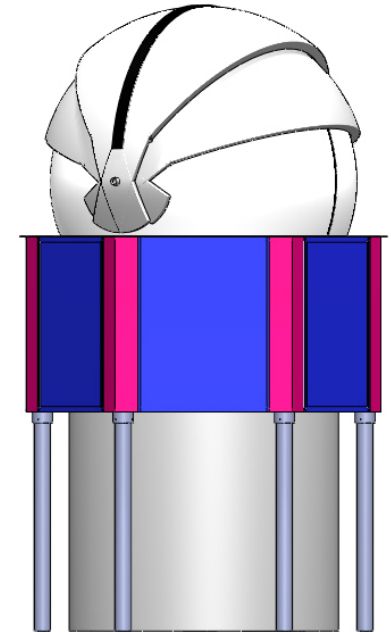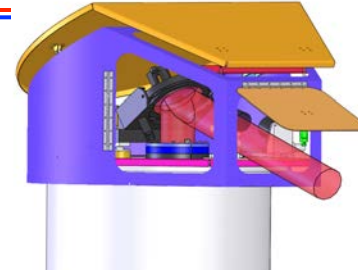
  – Additional funds being sought (DARPA, etc.)
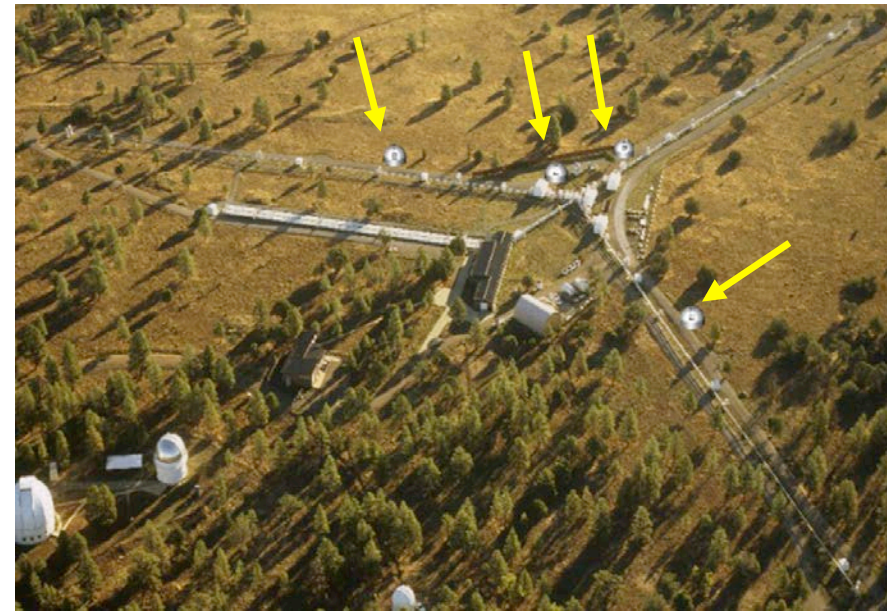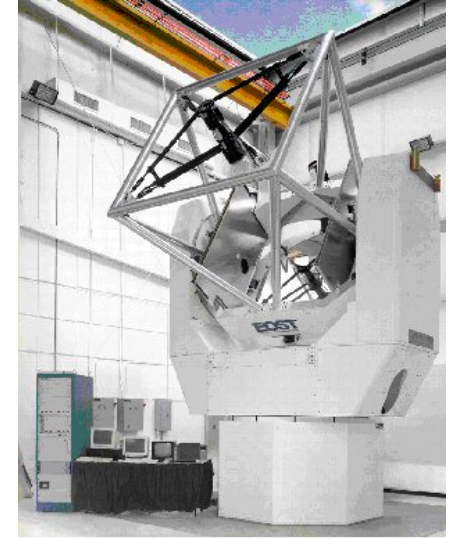
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NOI Update

Upgrades in Progress (2):

- **NRL "CPP" program:**

- Complete 6-station "imaging" (portable) siderostat array

- New enclosures for star acquisition & tip-tilt optics under construction

- New domes under construction for last 3 imaging siderostats

- Complete integration of Long Delay Lines (optics & control)

- Last 3 imaging stations, installed & commissioned in FY 12

- Baselines to 437m

NOI Update

Upgrades in Progress (3):

- PC-based <u>siderostat controllers</u> (SIDcons) for astrometric stations

  - Includes new 250kHz metrology

- PC-based <u>Fast Delay Line</u> (FDL) & <u>New Fringe Engine</u> in FY12:

  - Based on real-time Linux, 90% off-shelf components

  - New 2MHz metrology detection & (delay dither) piezo electronics

  - New stellar fringe engine implementation
    - » will allow increased bandpass (450-850nm, 32 channels)
    - » will allow use of all beam combiner outputs

NOI Update

Upgrades in Progress (4):

- VISION beam combiner:

    - NSF funded, PI: Matt Muterspaugh (Tennessee State Univ.)
    - 6-beam, visible-light analog of MIRC
    - fiber inputs tested at NOI in March 2011
    - final installation at NOI beginning April 2012

NOI Update

Research / Publications:

USNO – NOI Astrometric Catalog (UNAC):

- Goal: Catalog of >1000 stars with positions accurate to < 16 mas (tied to ICRF).

- Pipeline improvements over last year (full NOVAS implementation, fringe frame SNR weighting, improved atmospheric corrections & statistically robust position fitting) have yielded positions believed <u>accurate</u> at ~ 8 mas (~76 sources, δ > -10°).

- Need to: complete simultaneous 6-baseline solutions for first ~115 stars, check NOI positions of radio stars.

NOI Update

Research / Publications (2):

Stellar Diameters:

- *Confirming Fundamental Parameters of the Exoplanet Host Star ε Eridani Using the Navy Optical Interferometer*, Baines & Armstrong 2012, ApJ, 744, 138

Review Article (wide- and narrow-angle astrometry):

- *Ground-based Optical Interferometry*, Hutter 2012, Scholarpedia, under review

Coherent averaging / limb darkening:

- Jorgensen et al.: γ Sagittae, ξ Cygni,

Narrow-angle astrometry:

- Schmitt et al.: γ Leonis A + B

Geosatellites:

- Air Force CP3 (active illumination of satellite)
- DARPA Galileo (passive detection)
- Another NOI glint run?