



# NPOI Update

18 March 2013  
Don Hutter





# NPOI Update



## The “BASICS”

- NPOI = Navy Precision Optical Interferometer
- Major funding by Oceanographer of the Navy and Office of Naval Research
- NPOI is collaboration b/w USNO, NRL & Lowell Observatory



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



# NPOI Update



## The NPOI Team:

### USNO:

Paul Shankland  
Don Hutter  
Jim Benson  
Mike DiVittorio  
Bob Zavala

### NRL:

Richard Bevilacqua  
Sergio Restaino  
Tom Armstrong  
Jonathan Andrews  
Ellyn Baines  
Jim Clark  
Henrique Schmitt  
Chris Wilcox

### Lowell:

Jeff Hall  
Gerard van Belle  
Bill DeGross  
Lisa Foley  
Jason Sanborn  
Susan Strosahl  
Steve Winchester  
Ron Winner

### AZ Embedded Sys:

Tim Buschmann  
David Allen

### TSU:

Matt Muterspaugh  
Mike Williamson

### NMT:

Anders Jorgensen





# NPOI Update



## Current Capabilities:

- Simultaneous, group-delay fringe tracking on multiple baselines (6 stations)
- Bandpass 550-850nm in 16 channels ( $R \sim 30-50$ )
- Single-baseline fringe tracking to  $m_v = 6.7$
- Multi-baseline fringe tracking w/closure phase to  $m_v \sim 6.0$
- Operated by one observer, scheduled  $\sim 355$  nights/year



# NPOI Update



## Upgrades in Progress (1):

- **1.8 m telescopes:**

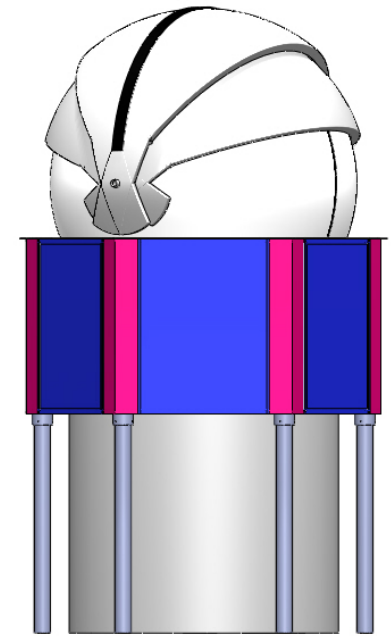
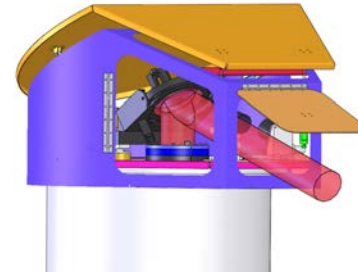
- Nov 2010: gifted to Navy (USNO Flagstaff) by CARA
- May 2012: Infrastructure (construction ready) plans finished
- July 2012: Special Use Permit from US Forest Service
- Currently: \$8.5M funded for FY15-19; plus \$10.7 unfunded in DoD planning
- See Paul Shankland's presentation immediately following.



# NPOI Update

## Upgrades in Progress (2):

- Completion of 6-station “imaging” (portable) siderostat array:
  - New enclosures for star acquisition & tip-tilt optics installed for 5 of 6 stations
  - New domes installed for 5 of 6 imaging siderostats
  - 2 more imaging stations to be commissioned in 2013
  - Baselines to 432 m
  - To complete: integration of Long Delay Lines







# NPOI Update



## Upgrades in Progress (3):

- Control systems upgrades:
  - PC-based siderostat controllers (SIDcons) for astrometric & imaging stations (4 installed; 5 more this year)
  - PC-based Fast Delay Line (FDL) control system:
    - \* Delivered to site & undergoing integration w/1<sup>st</sup> delay line
    - \* New Fringe Engine hardware finished; firmware & software under development
    - \* See Tim Buschmann's presentation at 2:20 pm.
  - New top-level control computer & observer log software
  - New systems sequencing control software (under test)
  - New "constant term" hardware, firmware & recording software (under test)
  - New tip-tilt mirror control software; hardware & firmware in progress





# NPOI Update



## Upgrades in Progress (4):

- **VISION** beam combiner:
  - See Matt Muterspaugh's presentation at 3:10 pm.
  - **NSF funded**, PI: Matt Muterspaugh (Tennessee State Univ.)
  - 6-beam, visible-light analog of MIRC
  - 11 Oct 2012: First stellar fringes (single Baseline)
  - 15 Jan 2013: First 4 station (6 Baseline) stellar fringes





# NPOI Update



## Research / Publications:

### USNO – NPOI Astrometric Catalog (UNAC):

- See Jim Benson's presentation today at 3:30 pm.
- **Goal:** Catalog of >1000 stars with positions accurate to < 16 mas (tied to ICRF).
- **Pipeline improvements** over last year include incorporating robust siderostat modeling (using stellar pointing & siderostat metrology data) in code for simultaneous siderostat, station & star position solutions (~115 stars).



# NPOI Update



## Research / Publications (2):

A sample from the last year:

- $\delta$  Sco – Che et al. ApJ, 757, 29
- $\zeta$  Ori - Hummel et al., A&A, Feb 2013
- 89 Her – Hillen et al., A&A, submitted
- b Per (AAS) - Sanborn & Zavala
- B stars (ASP) – Patience et al.

See also: papers tomorrow by Armstrong (1:50), Baines (1:30), Hummel (9:40) & Kloppenborg (4:40)