Observing Strategies For NOAO proposers

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What science do you want to do?

- Can we do it overall?
- Which instrument is the best for the science?
- Is the timing realistic?
  - How much data will be needed?
  - Is it in a part of the year that will facilitate the time needed?

About requesting time: The Technical Part of the Proposal

- From the proposal form-
  - Describe the observations to be made during this observing run. Justify the specific telescope(s), the number of nights, the instrument, and the lunar phase. List objects, coordinates, and magnitudes (or surface brightness, if appropriate) in the Target Tables section.

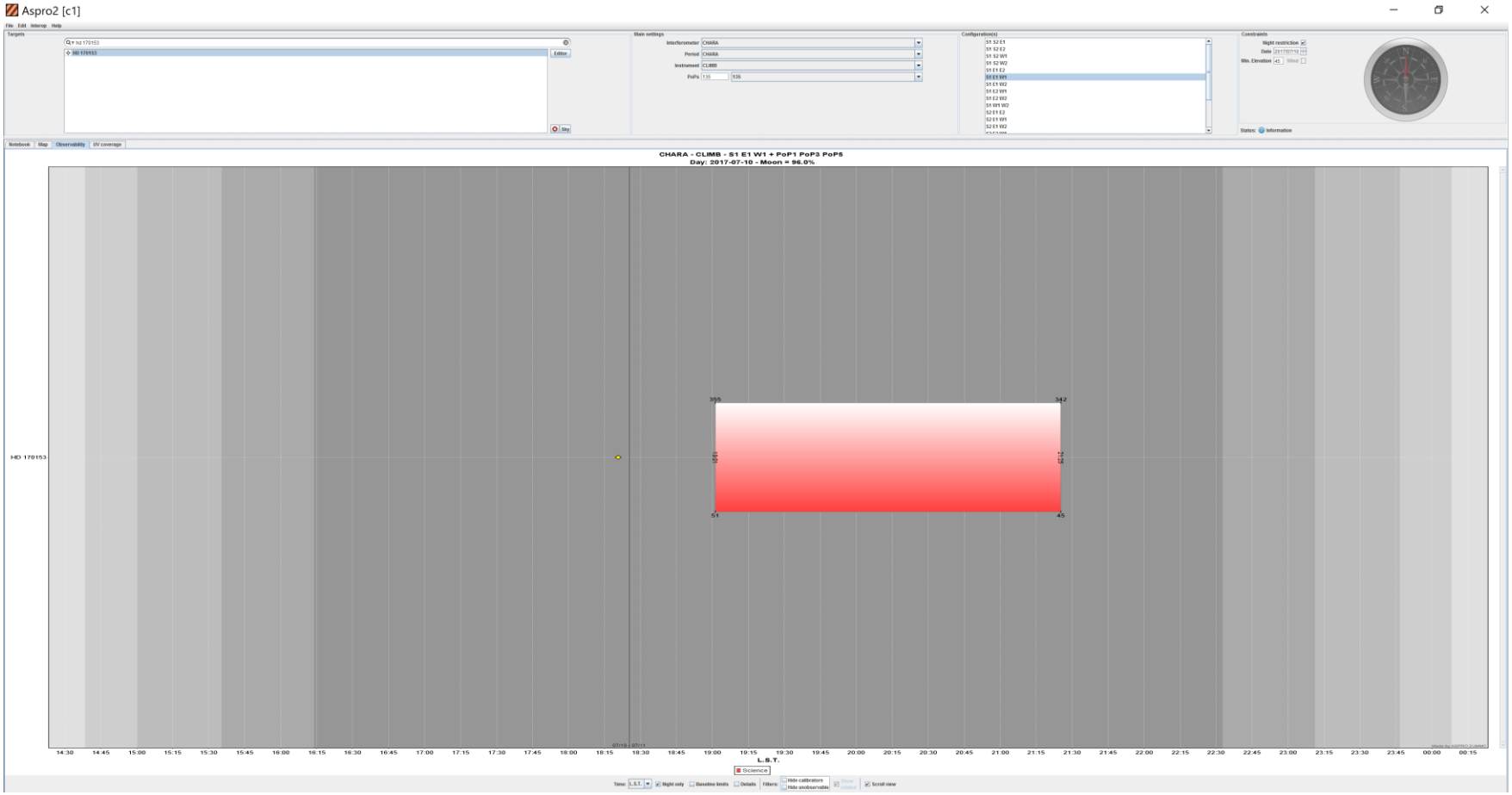
Choosing Baselines/Telescopes

- Instrument?
- Star type?
  - Single star (diameters)
  - Binaries/Multiple stars (separation, position angles)
  - Imaging?
  - Multi-wavelength?
- Can it be done at the time needed?
  - Delay?
    - Fixed increments – PoPs
    - Variable delay - carts

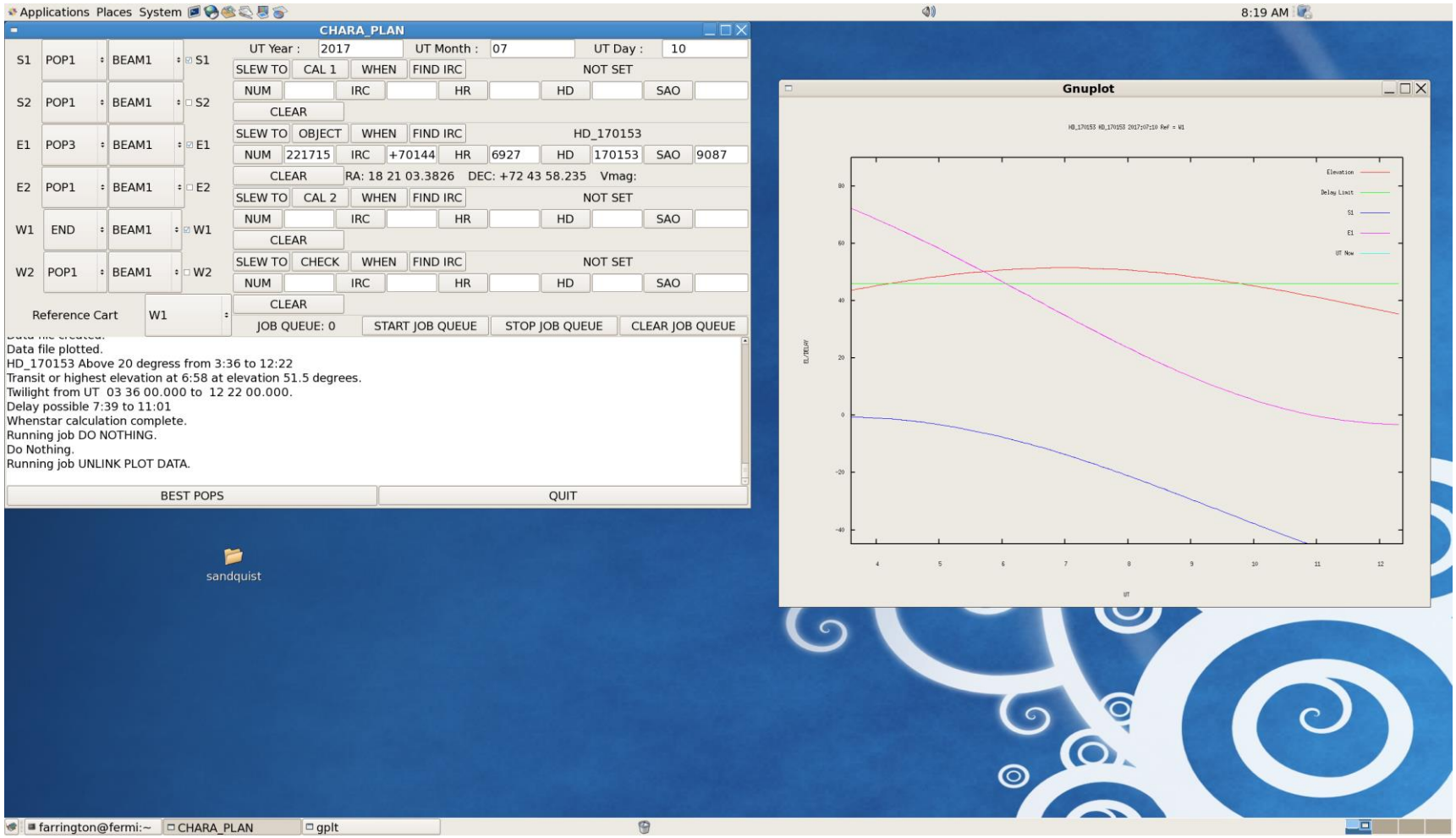
CHARA Plan and ASPRO

- Planning tools
  - ASPRO – Java
    - http://www.jmmc.fr/aspro_page.htm
    - Multi-star, full night planning tool.
  - CHARA Plan – Linux
    - http://www.astro.gsu.edu/~theo/chara_reduction/index.html
    - Most accurate, duplicate of control software, one star at a time.
- Complementary, not one or the other.
- Why use both?

ASPRO


Aspro2 [c1]
CHARA - CLIMB - S1 E1 W1 + PoP1 PoP3 PoP5
Day: 2017-07-10 - Moon = 96.0%
HD 170153
L.S.T.
Science

CHARA Plan and ASPRO



Beams and PoPs

- CLIMB – Beams 1-3 or 4-6
- Classic – Beams 5-6
- JouFLU – Beams 3-4 or 5-6
- MIRC – ALL
- PAVO – Beams 1-3
- VEGA – Beams 1-3 (4)
- PoPs – Used for selecting general areas of the sky. Can be switched during the night to follow stars (with some limitations).

Limitations of the Instruments

- Magnitude and wavelength
  - Array as a whole – Star tracking – 12-14 in R
  - Classic – 8.5 m_K (limit untested in H, 8?)
  - CLIMB – 7.0 m_K (limit untested in H, 6.5?)
  - JouFLU – 5.0 m_K
  - MIRC – 5.0 m_H
  - PAVO – 7.0 m_R
  - VEGA – 6.0 m_R (Needs fringe tracking with CLIMB + LDCs ~ 5.5-6.0 m_K)

Choosing Calibrators

- As the system as a whole has multiple factors that bring the ideal system visibility down from 1.0 to some fraction, we have to use calibrators to determine the real visibility of the target.
- Each combiner has different requirements for calibrators
- In general, we want single unresolved stars with somewhat similar magnitudes within a 10 degree square around the target.
- If the star passes near zenith, need calibrators on the same side (north or south) of zenith to avoid long slews.
- The smaller the difference the faster the data sequence, less fringe movement, etc.
- SearchCal tool from JMMC
  - http://www.jmmc.fr/searchcal_page.htm
- Minimum of two calibrators per object, three is better
  - Always finding unknown binaries

Actual Observing

- Observing Cadence
  - Also depends on instrument
  - Cal-Obj-Cal in general
    - For fast instruments (Classic, CLIMB, JouFLU, PAVO)
    - Cal1-Obj-Cal2-Obj- Cal1 or Cal1-Obj-Cal2-Cal1….
  - Slewing between object/cal from command to data sequence start generally less than 5 minutes including cart movement
  - Data sequence times (from star acq to end of file):
    - Depends on seeing
    - Fast instruments - approximately 5-7 minutes minimum
    - VEGA – Between 5-20 minutes
    - MIRC – 45-60 minutes

Observing Cont…

- The type of object will determine how much data you need
  - Diameters – Several brackets of data per baseline on two separate nights (for Classic/JouFLU/2T PAVO)
  - Binaries – Minimum of two brackets or SFP observations on 3 baselines (triangle)
  - Imaging – As many brackets that can be obtained in the time allowed, the more the better

Coming to the Array

- If awarded time, please contact me to discuss any questions you might have, and if you have never been to the CHARA Array before, please consider coming out to observe in person at least on the first night(s)
- farrington@chara-array.org