## Planning Observations at the CHARA Array



## **Gail Schaefer**

CHARA Array of Georgia State University

Planning Observations



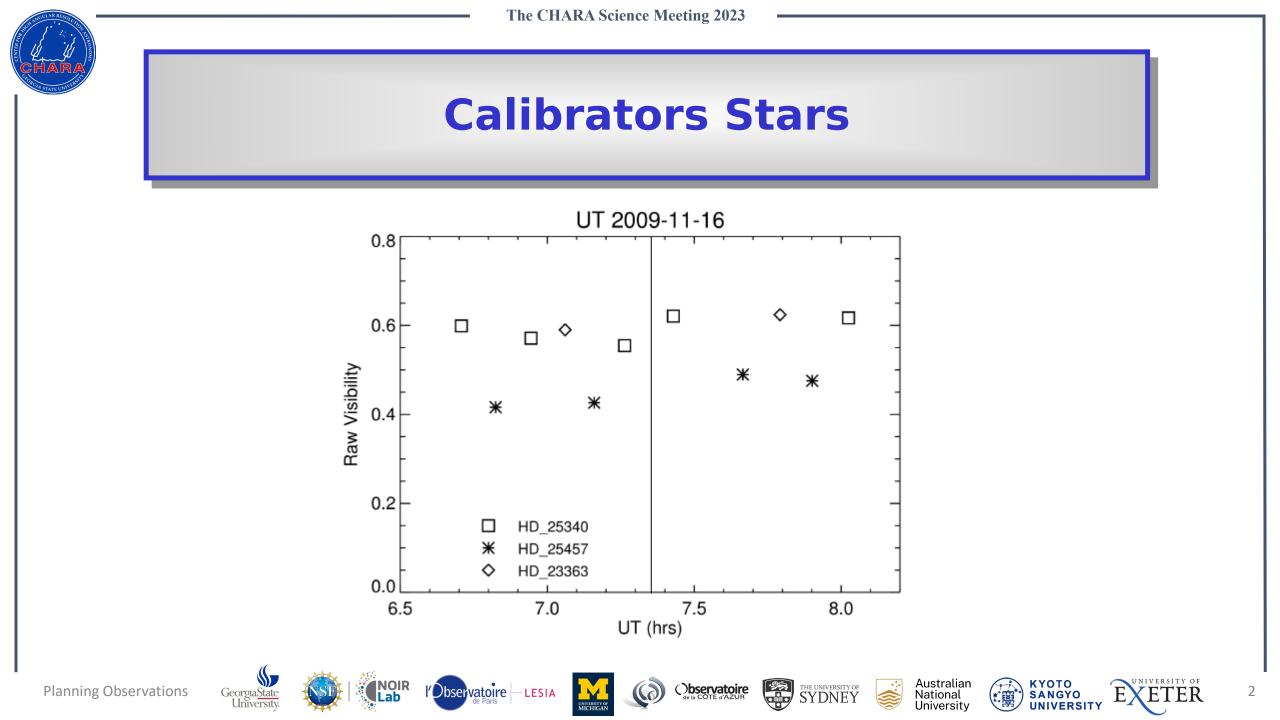


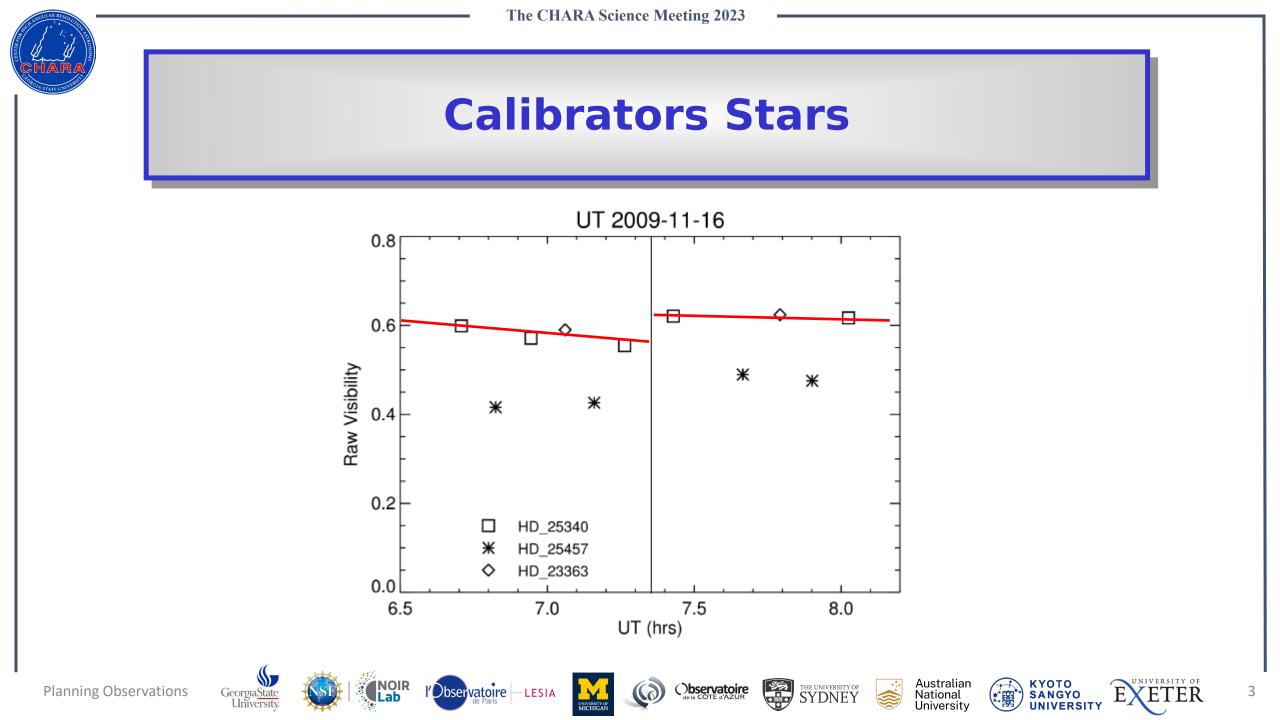












## **Selecting Calibrators**

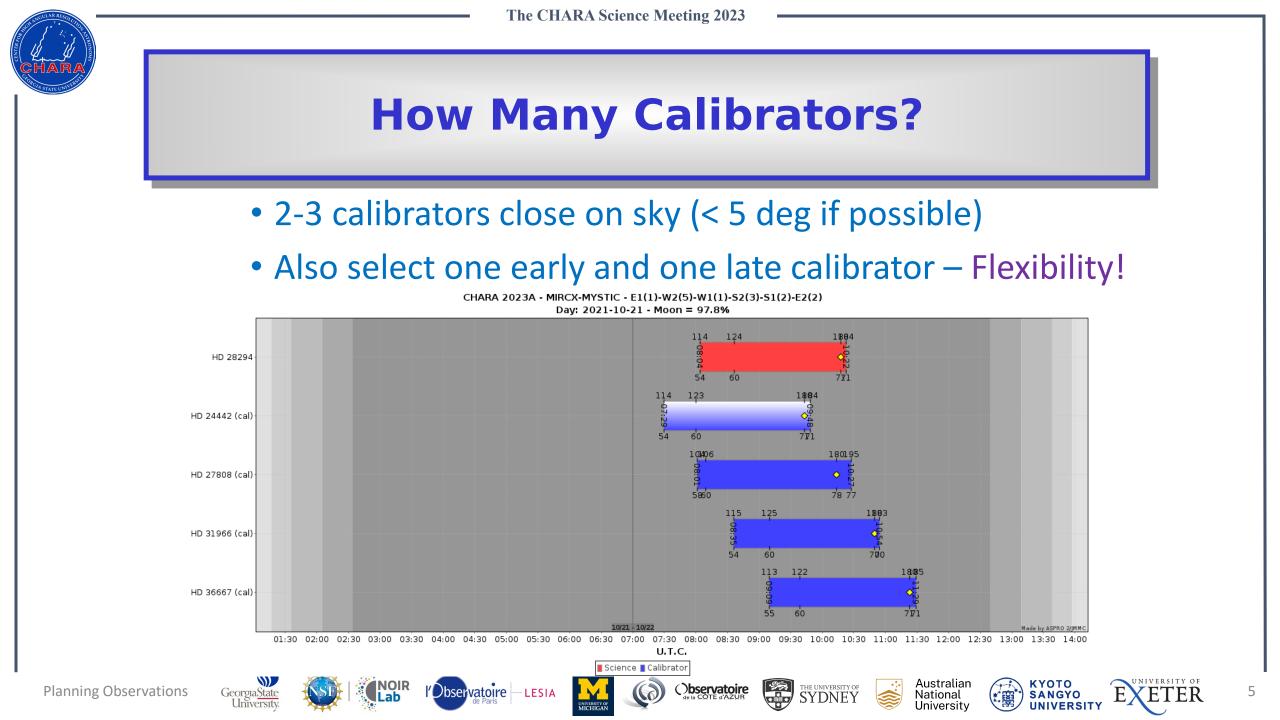
- Unresolved single stars
  - $\theta$  < 0.5 mas for H-band;  $\theta$  < 0.2 mas for R-band [for 300 m baseline]
  - If you need to go bigger, look for stars with known diameters (previous interferometric observations)
- Close in magnitude and color
  - Use same detector settings (within ~ 1 mag). Similar spectral response.
- Avoid calibrators too close to sensitivity limits
  - Challenging to observe + low SNR fringes poor calibration
- Literature search
  - Binarity, rapid rotation (vsini), photometric standard star, previous calibrator?











### Going on sky -Be Flexible and Prioritize!

- MIRC-X/MYSTIC observations usually take 30-45 min per star
  - If you only have 10 minutes left of delay, consider skipping to next target
  - ASPRO2 and CHARA delays might be off by a few minutes Don't be surprised if you end up having 5 minutes less than expected
- Look ahead make sure you have plenty of time for high priority targets







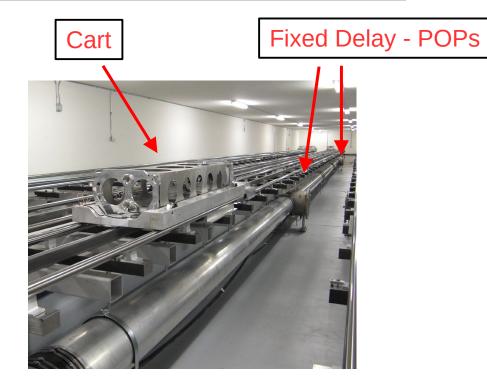






#### **Delay Lines, Carts, and POPs**





• Fixed delay added using POP mirrors in vacuum tubes

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• Continuously variable delay by carts on rails

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## **Optimizing POP Configurations**

• Optimize configuration to minimize POP changes during night

















## **Optimizing POP Configurations**

- Optimize configuration to minimize POP changes during night
- Imaging programs change pops to follow target through night

Observatoire

- After 6T windows end, collect 5T data
- E1 runs out of delay west of transit
- S1 runs out of delay in the north (DEC > 60 deg)

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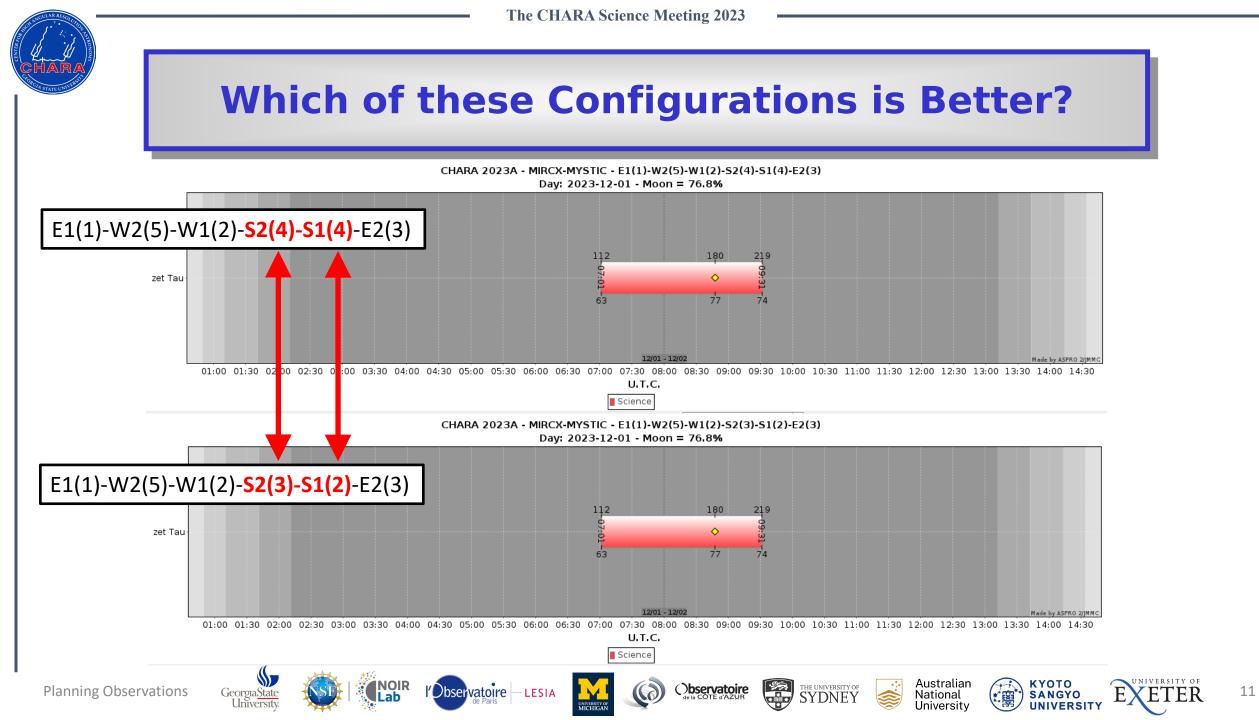
## **Optimizing POP Configurations**

- Optimize configuration to minimize POP changes during night
- Imaging programs change pops to follow target through night
  - After 6T windows end, collect 5T data
  - E1 runs out of delay west of transit
  - S1 runs out of delay in the north (DEC > 60 deg)
- Multi-target programs group stars with similar declinations together

Observatoire

• Similar POPs + share calibrators between targets

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#### **Use chara plan2 to fine tune ASPRO configurations: Optimize Delay Settings**

- On remote data reduction machine:
  - Type "chara\_plan2" in terminal window to start CHARA Plan

















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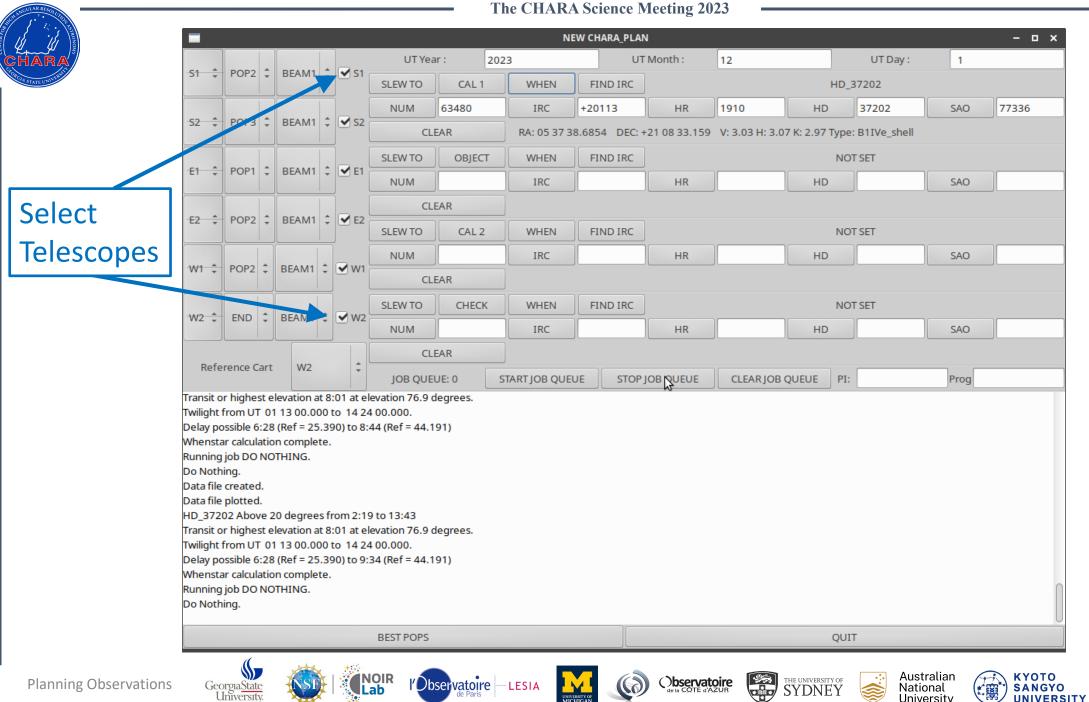
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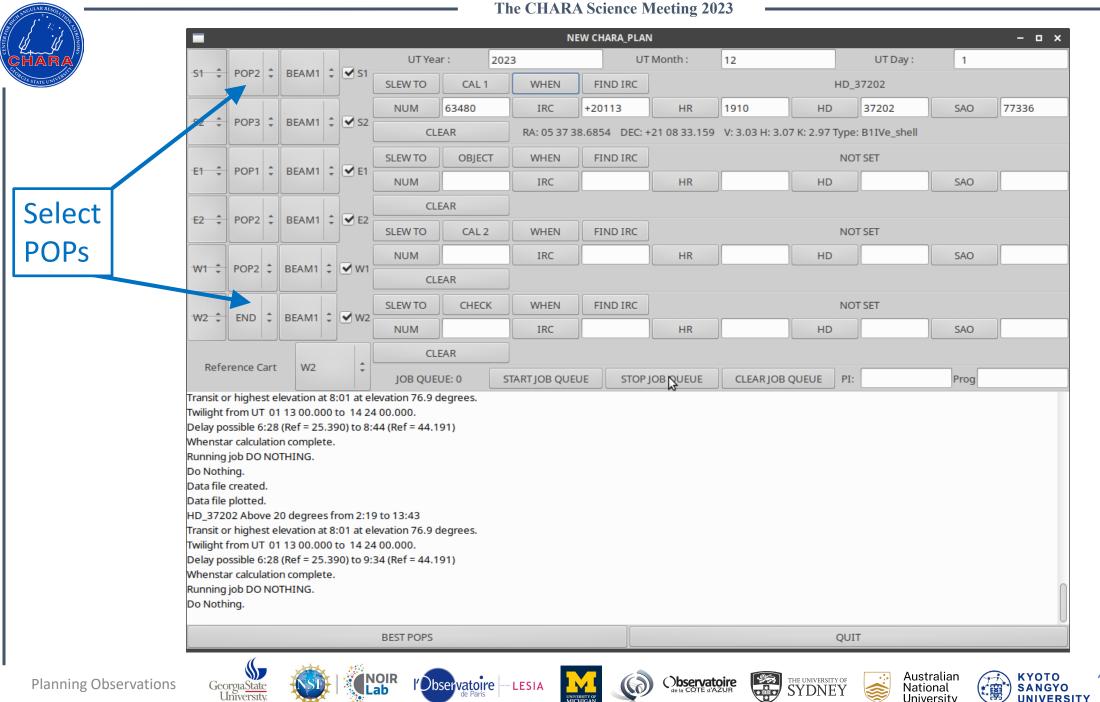


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**Planning Observations** 

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Planning Observations



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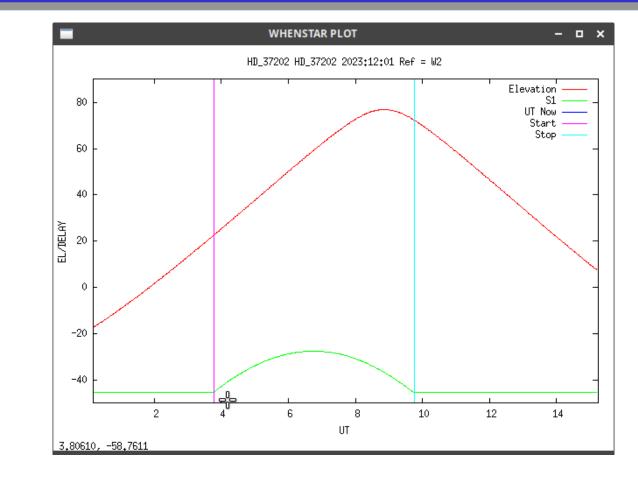
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### chara\_plan2: "WhenStar" Plot



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W2(5)-S1(4)

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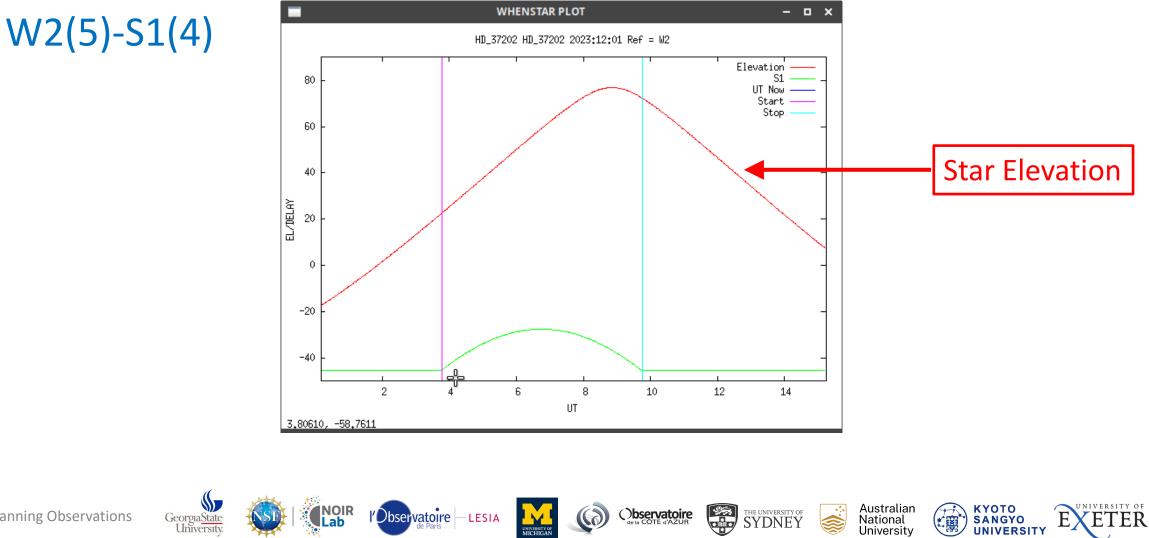
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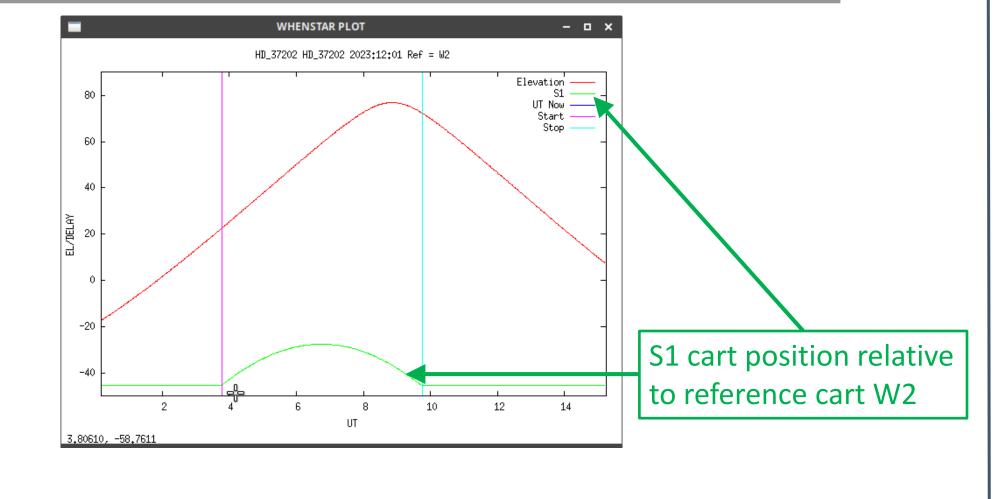
### chara\_plan2: "WhenStar" Plot



Planning Observations

### chara\_plan2: "WhenStar" Plot

W2(5)-S1(4)



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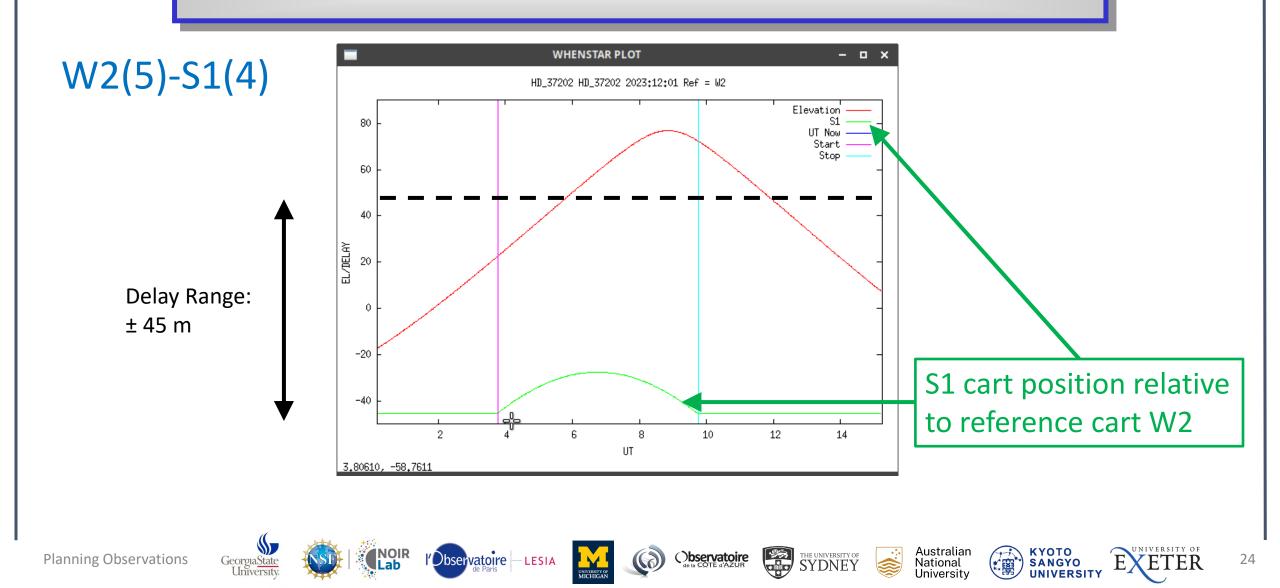
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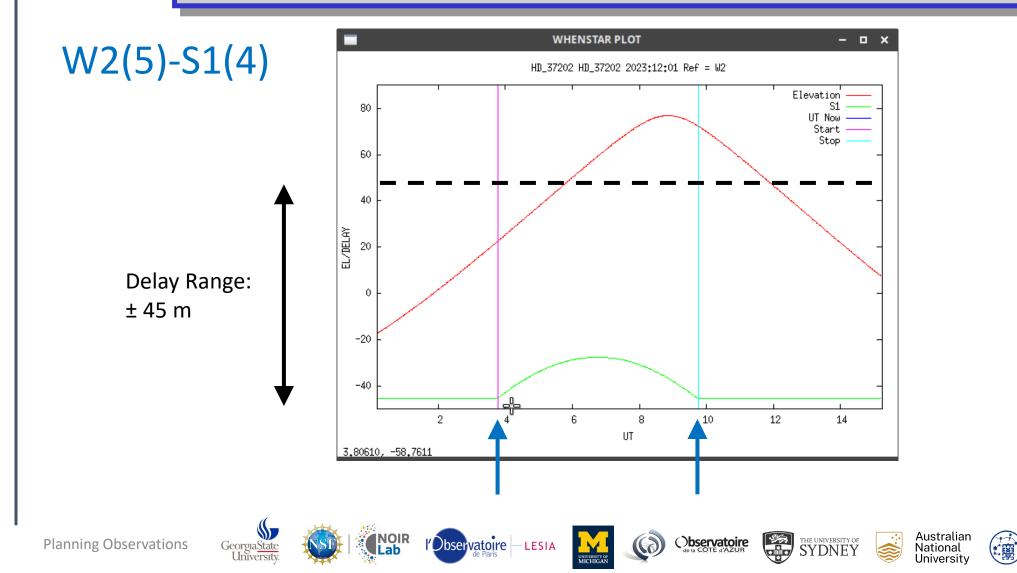
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### chara\_plan2: "WhenStar" Plot



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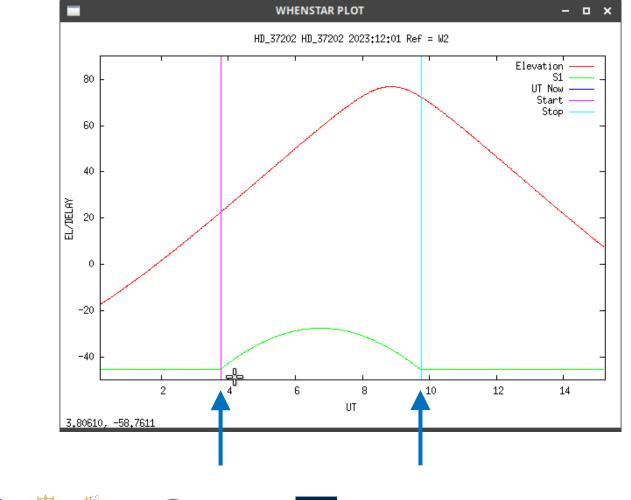
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### chara\_plan2: "WhenStar" Plot



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W2(5)-S1(4)



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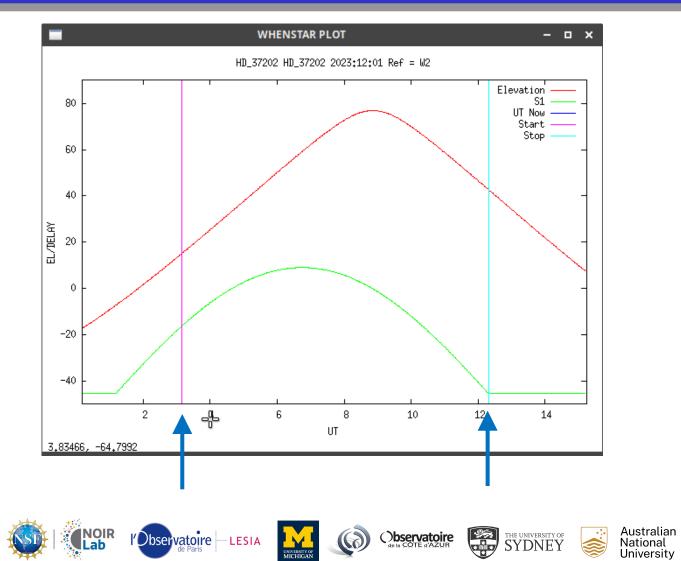
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### chara\_plan2: "WhenStar" Plot

W2(5)-S1(X) W2(5)-S1(2)

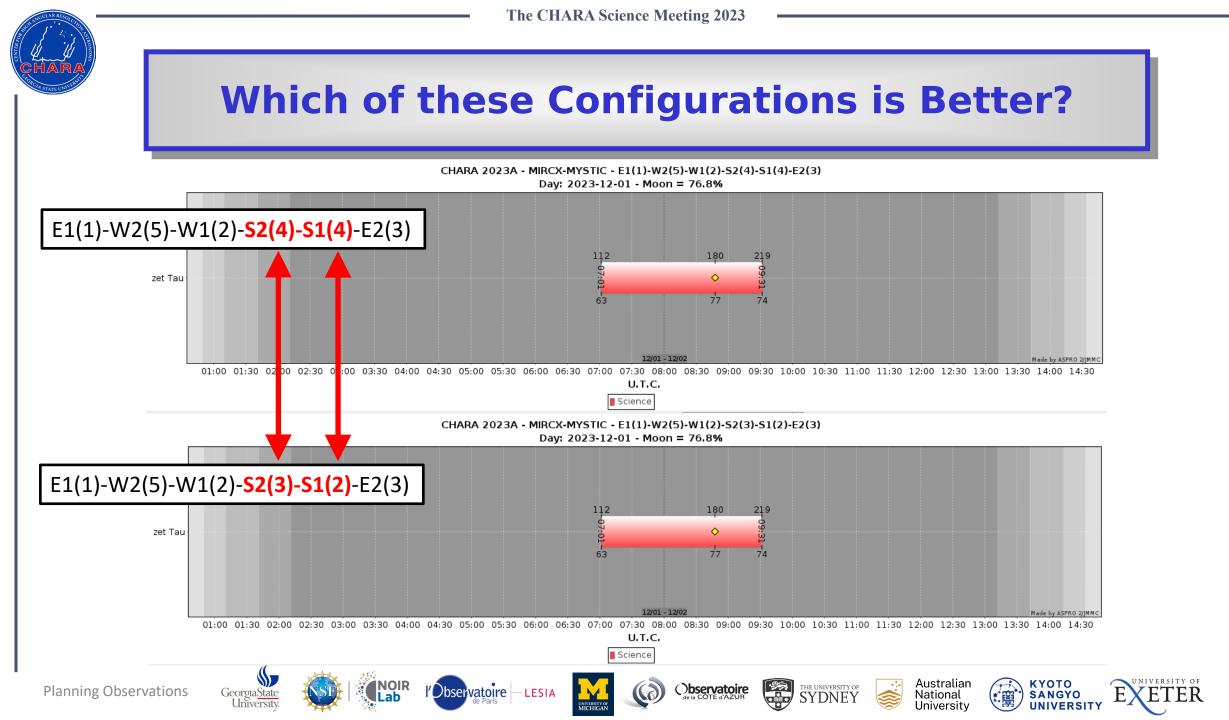


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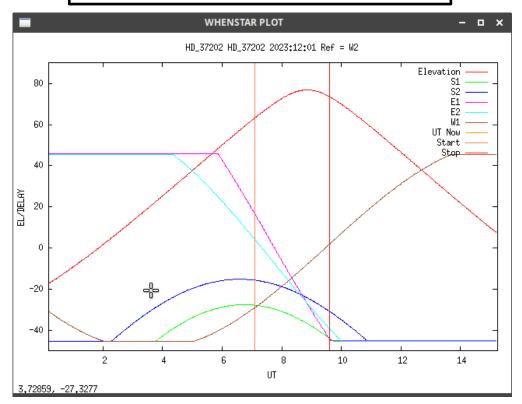
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#### chara\_plan2: "WhenStar" Plot

#### E1(1)-W2(5)-W1(2)-<mark>S2(4)-S1(4)</mark>-E2(3)



Planning Observations







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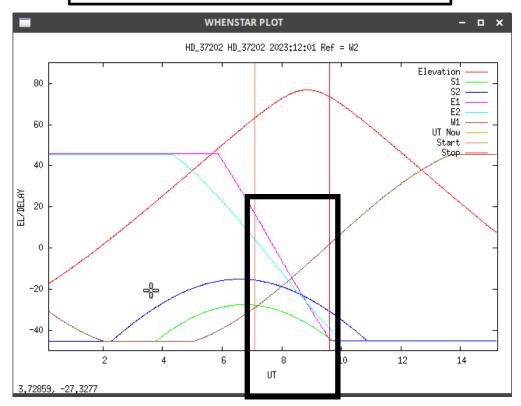




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### chara\_plan2: "WhenStar" Plot

#### E1(1)-W2(5)-W1(2)-<mark>S2(4)-S1(4)</mark>-E2(3)









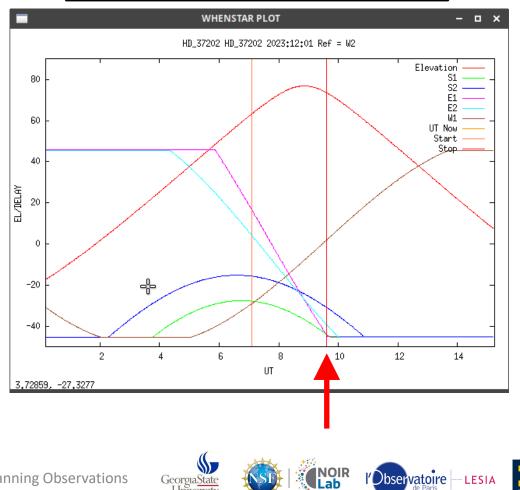
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### chara\_plan2: "WhenStar" Plot

#### E1(1)-W2(5)-W1(2)-S2(4)-S1(4)-E2(3)



Planning Observations





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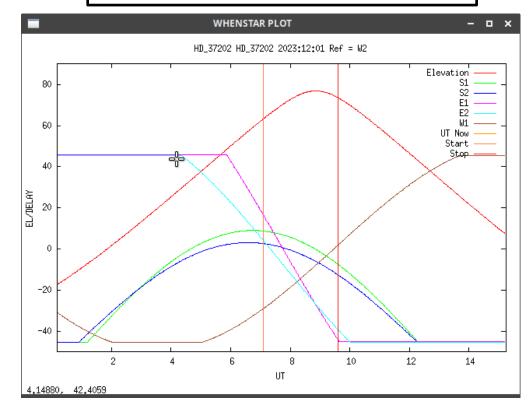




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### chara\_plan2: "WhenStar" Plot

#### E1(1)-W2(5)-W1(2)-S2(3)-S1(2)-E2(3)



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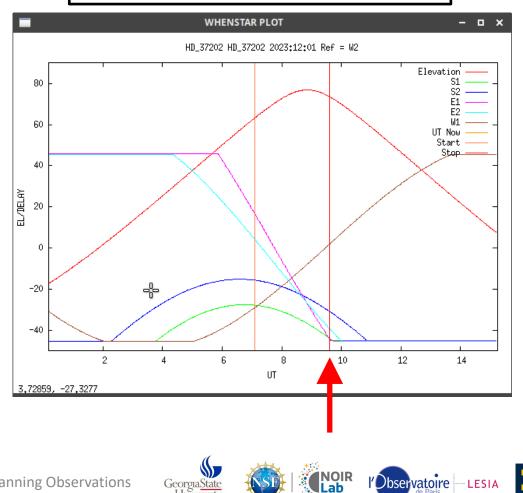
 $(\mathbf{d})$ 

Observatoire LESIA

KYOTO SANGYO UNIVERSITY

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#### E1(1)-W2(5)-W1(2)-S2(4)-S1(4)-E2(3)



Georgia<u>State</u> University

**Planning Observations** 

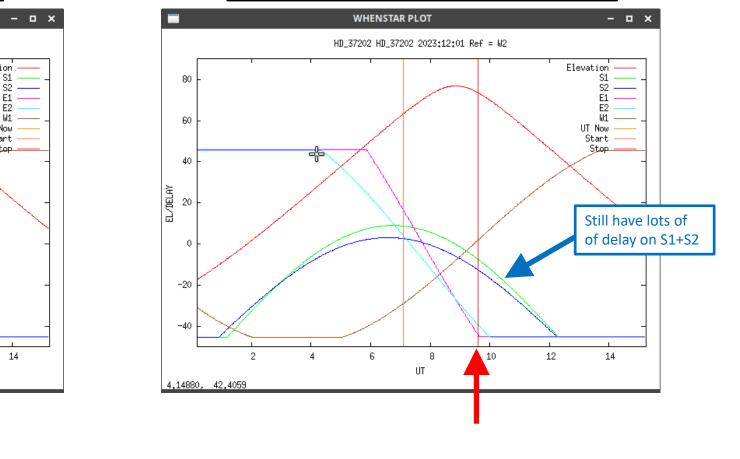


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### chara\_plan2: "WhenStar" Plot

#### E1(1)-W2(5)-W1(2)-S2(3)-S1(2)-E2(3)



THE UNIVERSITY OF SYDNEY

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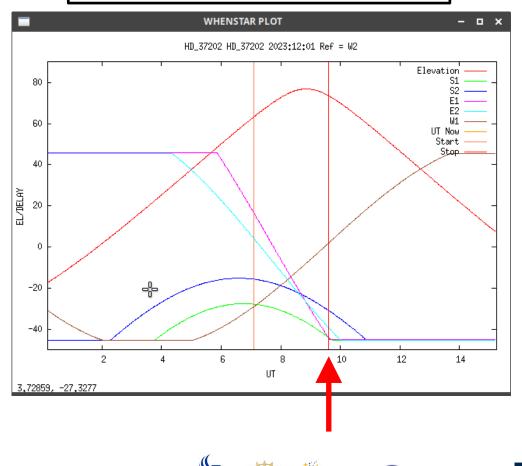
Australian National

University

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#### E1(1)-W2(5)-W1(2)-<mark>S2(4)-S1(4)</mark>-E2(3)



Georgia<u>State</u> University NOIR Lab

Observatoire LESIA

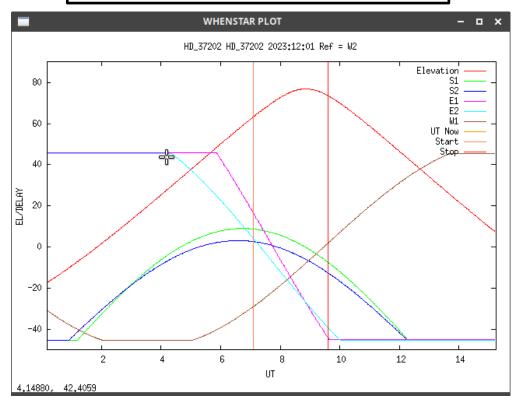
Planning Observations

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#### chara\_plan2: "WhenStar" Plot

#### E1(1)-W2(5)-W1(2)-S2(3)-S1(2)-E2(3)









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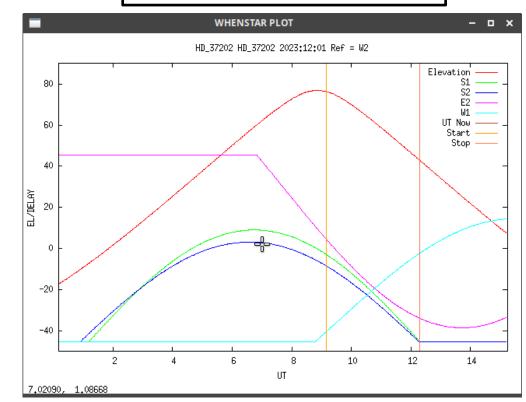


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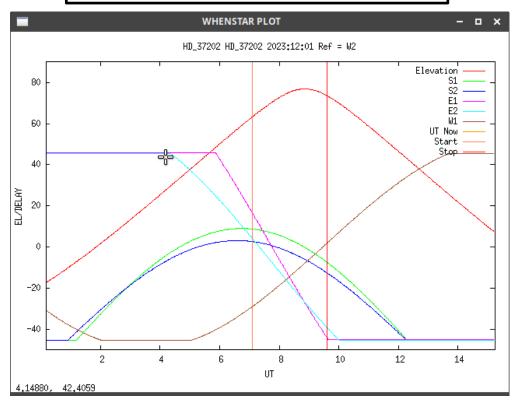
The CHARA Science	Meeting 2023
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### chara\_plan2: "WhenStar" Plot

#### W2(5)-W1(4)-S2(3)-S1(2)-E2(1)



#### E1(1)-W2(5)-W1(2)-S2(3)-S1(2)-E2(3)



Planning Observations





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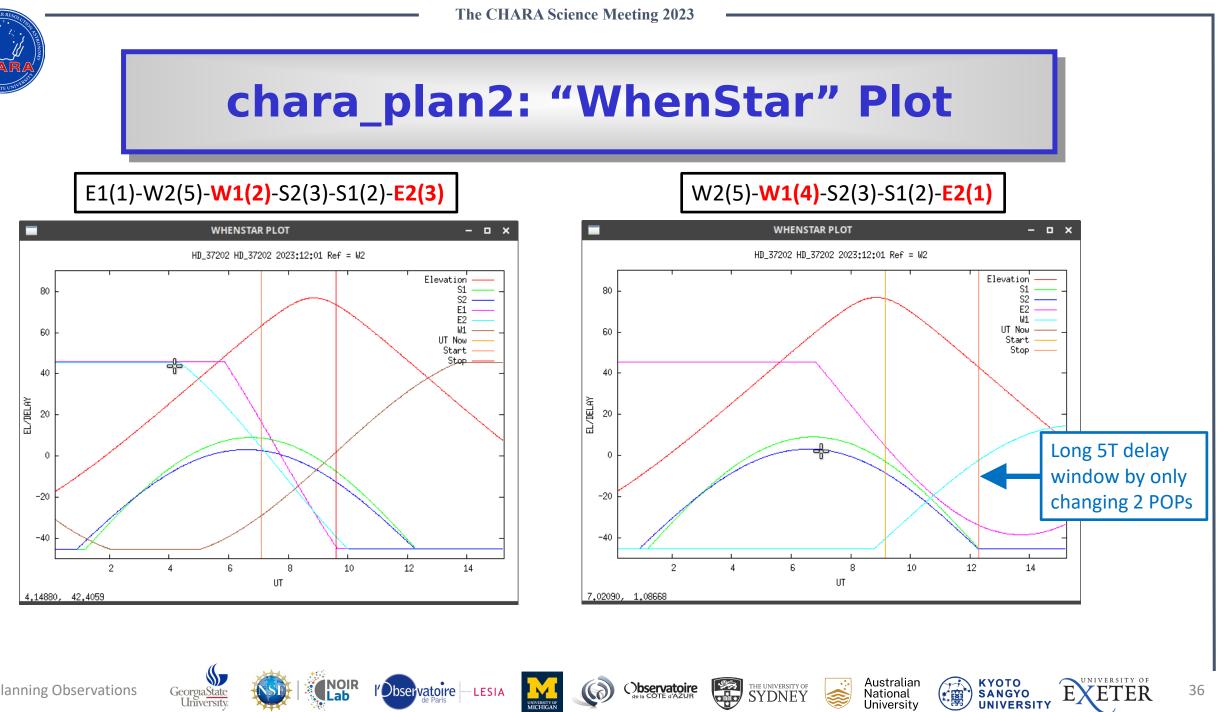
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**Planning Observations** 

Georgia<u>State</u> University

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# **Optimizing POPs**

- Use ASPRO2 as a first pass to select POPs
  - Maximize delay and optimize timing during night
- Use chara\_plan2 to fine-tune delay settings
  - Figure out which configuration is best
  - Minimize the number of POP changes during night more time for observing
- Use ASPRO2 while observing
  - Easy to add many science targets + calibrators
  - Good for planning full night of observations









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