ExEP Resources Available to Strategic Astrophysics Technology (SAT) PIs

Brendan Crill
Deputy Program Chief Technologist
NASA Exoplanet Exploration Program (ExEP)
Jet Propulsion Laboratory/California Institute of Technology

9/12/22

ExEP Resources for SAT PIs

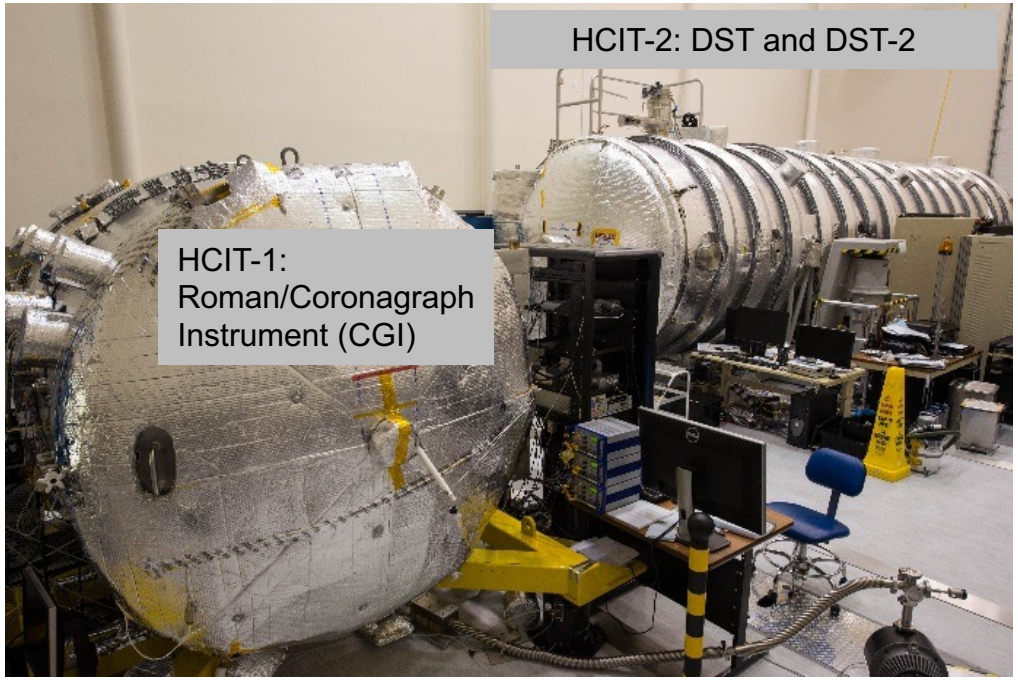
- **This presentation provides an overview of the ExEP resources located at JPL available to support a Strategic Astrophysics Technology (SAT) proposal.**

- **The available resources, if appropriate for your needs, may help you more efficiently meet your milestone goals and reduce your proposal costs and schedule.**

Available Resources

- **High Contrast Imaging Testbed (HCIT) laboratory:**
  - Vacuum coronagraph testbeds:
    - **Decadal Survey Testbed (DST)-1**
    - **DST-2 (commissioning in CY2023)**
    - **Vacuum Surface Gauge (for metrology)**
  - In-air coronagraph testbed

- **Starshade**
  - **Modeling software (SISTER)**
  - **Scatter measurement testbed**



Unavailable Resources

- HCIT-1 (dedicated to Roman)

Gaining Access to the ExEP Resources at JPL

How to Request Use of ExEP Resources at JPL

- **Submit preliminary Statement of Work (SOW) for use of ExEP resources to Brendan Crill no later than November 28, 2022.**
  - Follow SOW questionnaire on next page.

- **Schedule telecon with Brendan Crill before Dec 9, 2022 to discuss use of the resources of interest and to obtain costing guidelines.**
  - We will evaluate with the PI workforce, labor, and infrastructure access required across all received SOWs.
  - Proposal due date is Dec 15, 2022

- **Brendan Crill will supply the proposal PI a Letter of Commitment for use of any ExEP resources.**
  - PIs are to include both the SOW and the Letter of Commitment in their proposal (due December 15, 2022).
  - HCIT will provide workforce cost to set up testbeds; additional labor and unique procurements must be costed within the proposal.

- **The Letter of Commitment does not assure selection of the proposal; lack of a SOW or Letter in a submitted proposal could adversely affect proposals intended to utilize ExEP resources.**

SOW Questionnaire for Use of ExEP Testbed Resources

1. **Brief description of the proposed SAT**
2. **What resources are requested?**
3. **Milestone(s) to be accomplished and performance goals**
4. **Brief description of how the work will be conducted**
5. **Period(s) and preferred dates, if any, over which the resource is requested, stating whether in vacuum or air for testbeds. Include any time required for preparatory work.**
6. **A list of the personnel, expertise, and level of effort (if any) who will assist in the use of the resource.**
7. **Any anticipated changes to the resource needed to accommodate your demonstrations.**
8. **List of items needed for all testbed modifications. Identify items you will be procuring within your proposal's budget and provide approximate cost of needed items.**
    a. Otherwise, state that no additional procurements will be necessary for the use of the infrastructure under consideration.
9. **Provide any other relevant information or constraints.**

Strategic Astrophysics Technology Timeline

- The timeline for requesting access to ExEP resources is based on the dates specified in ROSES SAT-2022
- Mandatory notice-of-intent (NOI) to propose to SAT-2022 is due on November 4, 2022
- The proposal deadline is December 15, 2022

ExEP Technology Resources POC

For questions concerning use of ExEP technology resources or requests for more detail contact:

Dr. Brendan Crill

Jet Propulsion Laboratory

4800 Oak Grove Drive

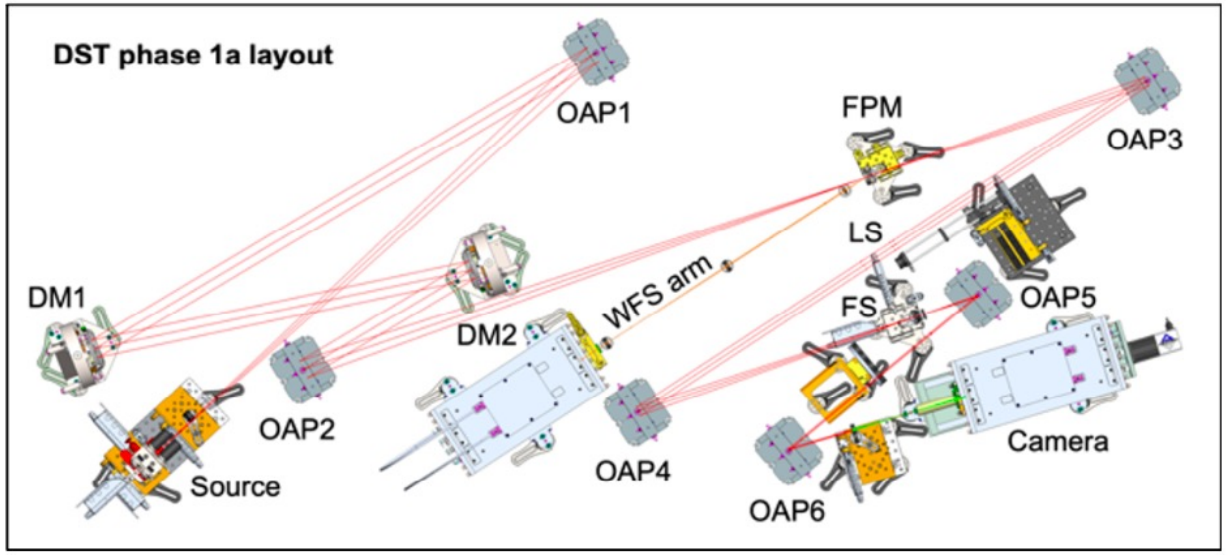
Pasadena, CA 91109

Office: (818) 354-5416

Email: bcrill@jpl.nasa.gov

Additional Slides

Decadal Survey Testbed bench layout



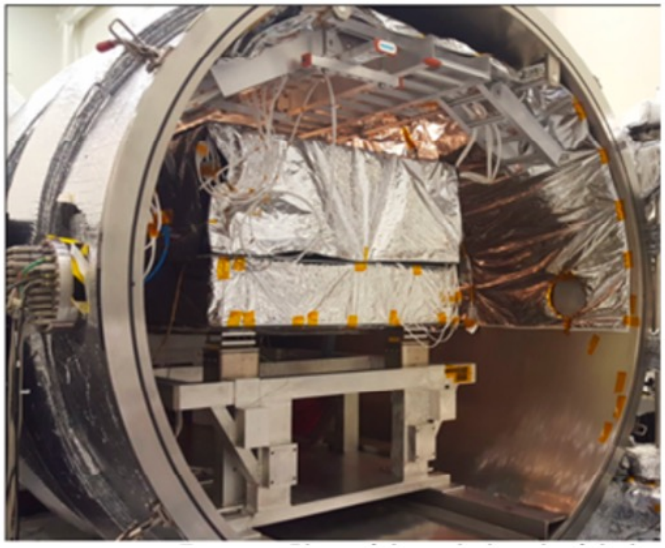


Figure 1: (Left) DST phase-1a commissioning layout. (Right) The DST bench in the HCIT2 vacuum chamber, covered in multi-layer insulation (MLI) and resting atop a support frame, Minus-K isolators, and Vespel platforms.

Patterson et al. 2019 SPIE proceedings

Decadal Survey Testbed 2 bench layout

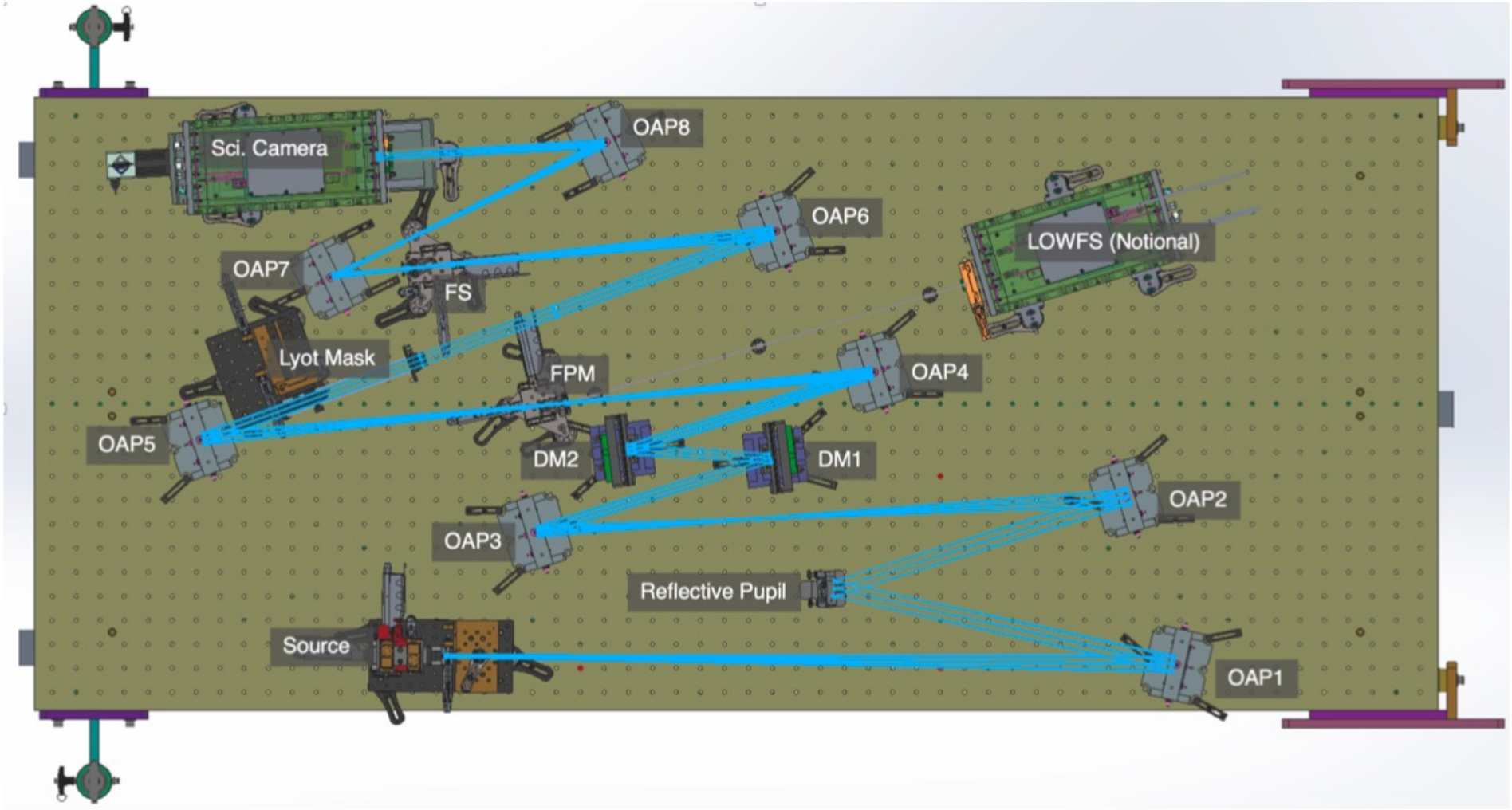


Figure 6: Top-down view of the DST2 bench CAD model with Zemax raytrace overlaid. Key elements are labeled.

Meeker et al. 2021 SPIE proceedings

Starshade Imaging Simulation Toolkit

SISTER is a Matlab-based, versatile tool designed to provide accurate, diverse starshade astrophysical simulations.

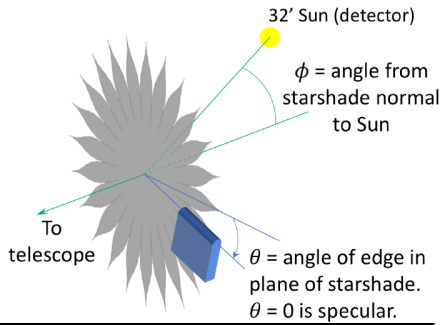
It allows for controlling a set of instrument and system parameters :

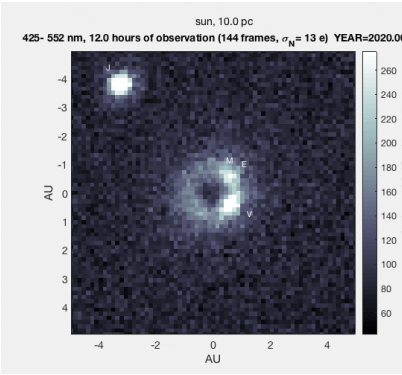
(1) the starshade design and position,
(2) the exoplanetary system,
(3) the optical system (telescope) and
(4) the detector (camera).

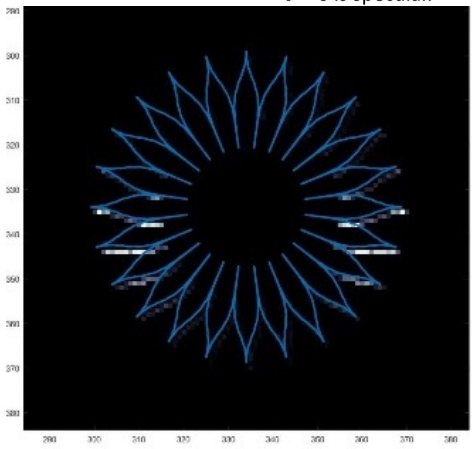
There is a built-in plotting software added, but the simulations may be stored on disk and plotted with any other software.

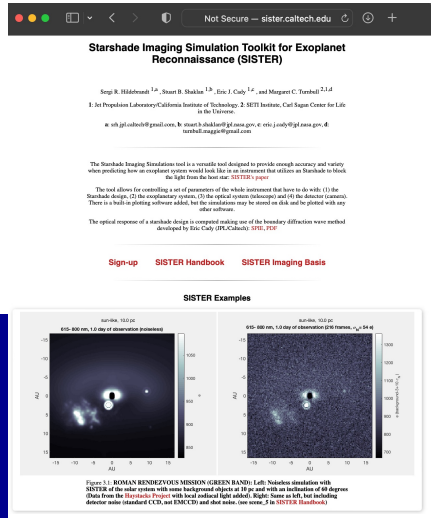
SISTER is an open source, well-documented project that will evolve with starshade.

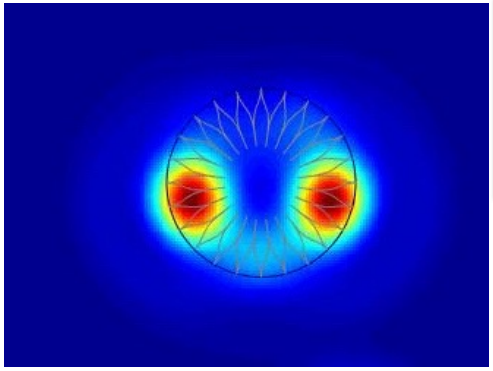
Other modeling capabilities developed by S5 may be available to proposers.







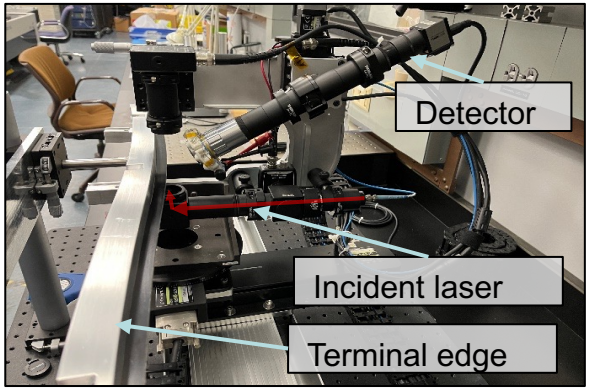


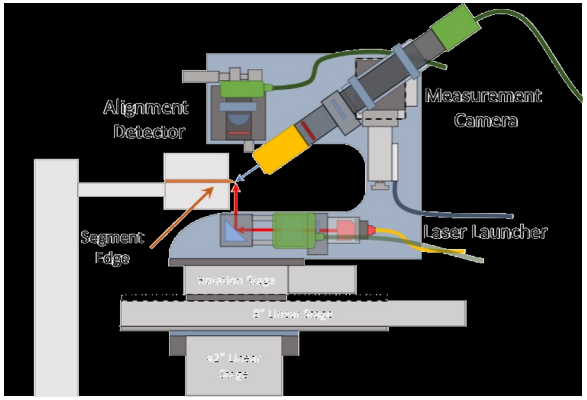


sister.caltech.edu

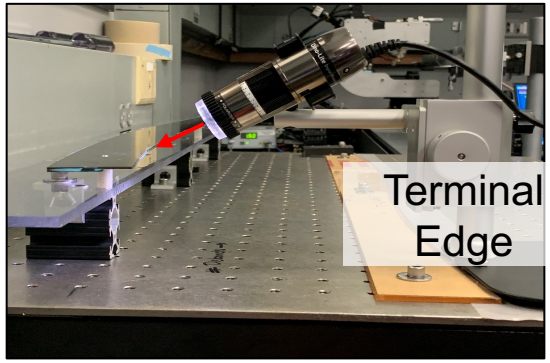
Starshade Scatter Measurement Testbed

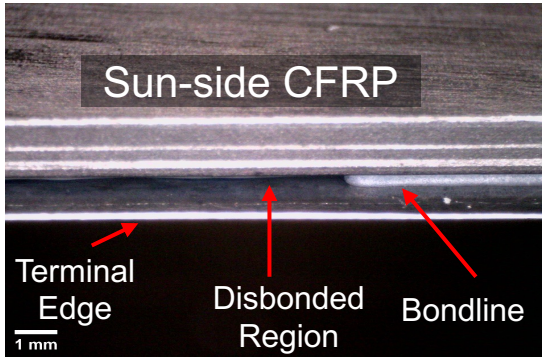
Single-angle scatterometer (SAS)



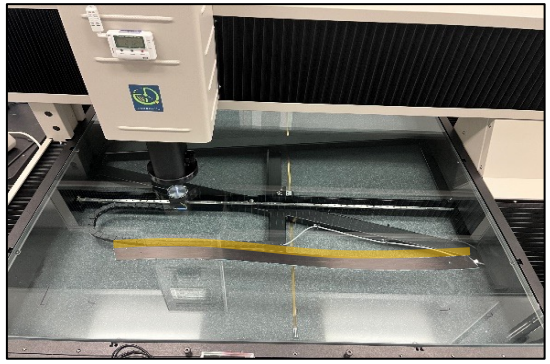


Microscopic Inspection





In-plane shape measurement (MicroVu)



The S5 Scatter Measurement Testbed includes custom metrology systems to measure shape and scatter performance of optical edges and other starshade components.