



*Pre-proposal Briefing:*  
2011 Strategic Astrophysics Technology (SAT)  
Solicitation,  
Technology Development for Exoplanet Missions  
(TDEM) Element

## Introduction and Overview

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## The Strategic Astrophysics Technology Program (SAT)

- Technology Development for Exoplanet Missions (TDEM) Program introduced in ROSES 2009 NRA;
- Technology Development for the Cosmic Origins Program (TCOP) and Technology Development for the Physics of the Cosmos Program (TPCOS) introduced in ROSES 2010 NRA and grouped with TDEM to form the Strategic Astrophysics Technology Program (SAT);
- Three elements are coordinated, but operate independently. Each element has its own Program Officer and funding line (the SR&T line in the associated program—Exoplanet Exploration, Cosmic Origins, Physics of the Cosmos)
- This briefing is specifically for people interested in proposing under the TDEM element of the SAT solicitation. People with questions about the other elements of the program should contact the appropriate program officer:
  - **TPCOS – Rita Sambruna ([Rita.M.Sambruna@nasa.gov](mailto:Rita.M.Sambruna@nasa.gov))**
  - **TCOP – Mario Perez ([Mario.Perez@nasa.gov](mailto:Mario.Perez@nasa.gov))**



## The Role of the SAT/TDEM element

- The overarching goal of NASA's Exoplanet Exploration Program (ExEP) is to advance NASA's efforts to detect and characterize planets and planetary systems around other stars.
- The long-term goal of the program is to develop and execute a ***New Worlds*** mission such as that described in the 2010 Decadal Survey of Astronomy and Astrophysics (Astro2010)—a space flight mission capable of imaging and spectroscopy of habitable, terrestrial planets in the Solar neighborhood.
- The Technology Development for Exoplanet Missions (TDEM) element of the SAT program was established to facilitate overcoming the numerous significant technological hurdles associated with implementing a future New Worlds mission.
- SAT/TDEM represents the implementation of the ***New Worlds Technology Development*** program recommended by Astro2010.



# Scope of Program



- **Scope of the SAT/TDEM Program**

- focused development of key technologies that feed into exoplanet exploration measurement techniques for future flight hardware.
- Program designed to address maturation of mid-TRL technologies ( $3 < \text{TRL} \leq 6$ ); technologies established as feasible (TRL 1-3), but insufficiently mature to incorporate into a flight mission (TRL 6-9).
- Not intended to support ‘basic’ research into new technologies and initial demonstration of their feasibility.
- Not intended to support development of flight hardware (TRL 7-9)

- **Areas of technology development of particular interest to the TDEM program include (but not limited to):**

- Starlight suppression  
*technologies for rejecting scattered starlight to the degree required to image an Earth-like planet around a sun-like star in the Solar neighborhood.*
- Wavefront sensing and control  
*control algorithms, sensing technology, and deformable mirror technology required to control light paths within both coronagraphic and interferometric systems to subnanometer precision.*
- System performance assessment  
*development of high-fidelity, very high density models to infer expected picometer-level on-orbit performance based on nanometer-level ground measurements.*



# Programmatic Information



## Proposals must:

- Provide a convincing case that the maturity of the subject technology falls in the range  $3 \leq \text{TRL} < 6$ .
- Make a compelling case that that subject technology is important and relevant to one or more of the SAT/TDEM development focus areas.
- Articulate the expected technology advancement
  - *Identify state of technological readiness at beginning*
  - *Identify one or more quantitative milestones that will be achieved over course of proposed development project.*
  - *Identify success criteria for evaluating project performance at end of 2 yr project.*
  - *Provide a detailed schedule for achieving milestones*

The SAT/TDEM call is updated and amended each year to reflect evolving program priorities. These program priorities are described in the annual *ExEP Technology Plan Appendix* and will be considered in the selection process. **Proposers are strongly advised to consult the Tech Plan Appendix before preparing their proposal.** The 2011 appendix is available for download at: <http://exep.jpl.nasa.gov/reportsAndDocuments/>.

The goal of TDEM program is advancement of key technologies to TRL 6-7; however, it is neither required nor expected that this process will be completed within the time frame of the proposed investigation; the long-term goal(s) of the proposed work may extend beyond proposed period of performance.



# Reporting Requirements



- Annual Progress Report
  - A written report, submitted to the SAT/TDEM program officer, detailing the status of the project, progress over the preceding year, and plans for the coming year is required annually.
- Final Report
  - Written report submitted at end of second year detailing project performance against proposed success criteria.
- Formal Documentation of Milestones
  - When work begins, success criteria of a technology demonstration is documented in a whitepaper
    - *Reviewed by independent board appointed by NASA Headquarters, and revised as necessary according to review.*
  - Successful achievement of milestone is documented in a second report that shows success criteria have been met
    - *Also subject to review and verification by independent board.*



# Current SAT/TDEM Investigations



## ExoPlanet Exploration Program

Title	PI	Organization
MEMS Deformable Mirror Technology Development for Space-Based Exoplanet Detection	Bierden, Paul	Boston Micromachines
Advances in Pupil Remapping (PIAA) Coronagraphy: Improving Bandwidth, Throughput and Inner Working Angle	Guyon, Olivier	University of Arizona
Environmental Testing of MEMS Deformable Mirrors for Exoplanet Detection	Helmbrecht, Michael	Iris AO, Inc.
Verifying Deployment Tolerances of an External Occulter for Starlight Suppression	Kasdin, N. Jeremy	Princeton University
Integrated Coronagraph Design and Wavefront Control using Two Deformable Mirrors	Kasdin, N. Jeremy	Princeton University
Compact Achromatic Visible Nulling Coronagraph Technology Maturation	Lyon, Richard	NASA Goddard Space Flight Center
Visible Nulling Coronagraph (VNC) Technology Demonstration Program	Sandhu, Jagmit	Jet Propulsion Laboratory
Demonstrations of Deep Starlight Rejection with a Vortex Coronagraph	Serabyn, Gene	Jet Propulsion Laboratory
Coronagraph Starlight Suppression Model Validation: Coronagraph Milestone #3A	Shaklan, Stuart	Jet Propulsion Laboratory

- Abstracts of current and past SAT/TDEM investigations are available through the 2009 and 2010 Strategic Astrophysics Technology solicitation web pages in the NSPIRES system.



## 4. Summary of Key Information



- Total funding available for new awards: **\$4.1M**
- Expected number new awards: **~ 5–10**
- Expected Period of Performance: **2 or 3 years**
- Notices of Intent due: **January 27, 2012**
- Proposal due date: **March 23, 2012**
- Start Date of new awards: **January 1, 2013**
- Website for proposal submission (NSPIRES):
  - <http://nspires.nasaprs.com/>
  - NSPIRES Helpdesk [nspires-help@nasaprs.com](mailto:nspires-help@nasaprs.com) or (202) 479-9376
- Detailed instructions for proposal preparation
  - NASA 2011 Guidebook for Proposers, <http://www.hq.nasa.gov/office/procurement/nraguidebook/>
- SAT/TDEM Program Officer: Douglas Hudgins, NASA Headquarters  
[Douglas.M.Hudgins@nasa.gov](mailto:Douglas.M.Hudgins@nasa.gov), (202) 358-0988