

Call for Letters of Application for Membership in the Science and Technology Definition Teams for Reduced-Scale Exoplanet Direct Imaging Mission Concepts

January 2013

During the second quarter of 2013, NASA's Exoplanet Exploration Program (ExEP) plans to establish two Science and Technology Definition Teams (STDTs) to study concepts for a potential future reduced-scale (total mission cost less than \$1B) strategic exoplanet direct detection mission. These Exoplanet STDTs are being constituted to assist the Astrophysics Division, through its ExEP Program Office, in identifying and developing reference mission concepts of high scientific, technical, and programmatic merit that would both advance the compelling scientific priorities articulated in the 2010 Decadal Survey of Astronomy and Astrophysics (Astro2010) and be executable within the Astrophysics Division's current budget profile. This letter is issued to announce the establishment of these STDTs and to solicit applications for participation from U.S. scientists with expertise and experience in all aspects of exoplanet science, including observation, theory, and instrumentation.

Background:

The singularly compelling nature of the quest for habitable planets around other stars was recognized by Astro2010, which advocated a vigorous program of precursor science and technology development that could be executed over the decade. That program was designed to provide the scientific underpinning and technological maturity required to develop a robust concept for a flagship-class exoplanet mission capable of imaging and spectroscopy of Earth-sized rocky planets orbiting in the habitable zones of nearby Sun-like stars. It was envisioned that such a mission concept would be submitted for consideration by the next Decadal Survey with the potential for new start in the 2020 decade.

However, a number of significant changes in the budgetary landscape of NASA's Astrophysics Division have emerged over the two years since the release of Astro2010. It now appears unlikely that a flagship-class mission will be executable on the time scale envisioned in that document. In response to these budgetary challenges, NASA's Astrophysics Division has initiated a series of community-based studies to investigate and develop concepts for reduced scale (total mission cost less than \$1B, hereafter "probe-class") strategic missions that would be capable of advancing the scientific priorities articulated in Astro2010 while still being executable within the Division's budget profile for the coming decade and beyond. To date, these efforts have included studies of concepts for a reduced scale implementation of the Decadal Survey's Wide-Field InfraRed Survey Telescope (WFIRST), as well as probe-class X-Ray and Gravitational Wave Observatories. This letter is issued to initiate the formation of two Exoplanet STDTs that will be tasked with defining the science capabilities and reference mission architectures for probe-class missions that would be capable of directly imaging and characterizing extrasolar planets.

An additional study may be conducted to consider probe-class mission concepts capable of addressing high priority decadal survey science goals using indirect detection techniques that

require no new technology. However, the decision on whether to establish a third Exoplanet STDT is deferred until the near-term budgetary and programmatic landscape of the program is clarified. The status of this potential third STDT will be announced by June 2013.

Task Description:

The Exoplanet Exploration Program Office will work with the science community to develop new probe-scale mission concepts capable of *direct imaging* of exoplanets. Two STDTs will be established. One will explore potential probe-class implementations involving the use of an internal coronagraph, while the other will explore potential probe-class implementations involving the use of an external occulter (starshade). These studies will be conducted in direct support of the recently released NASA Astrophysics Implementation Plan (<http://science.nasa.gov/astrophysics/documents>) and address the science priorities outlined in Astro2010. The studies will help refine the ExEP technology plans for this decade, and identify potentially viable and scientifically compelling probe-class mission candidates that could be ready to enter the Formulation Phase prior to the launch of JWST.

Leading toward the NRC Mid-Decade Review, the results of the concept studies will be considered by the NASA Astrophysics Division and jointly evaluated along with studies from both the Physics of the Cosmos Program and the Cosmic Origins Program. The probe-scale mission concepts developed by the STDTs are intended to be representative of concepts that are fully responsive to the constraints described above. They are not intended to be the only possible probe-scale exoplanet mission concepts for consideration by the Astrophysics Division in its strategic planning.

The science goal of each Exoplanet STDT will be to establish science requirements, investigation approaches, key mission parameters, and other scientific studies needed to support the definition of an implementable space mission concept. The technical goals of each STDT will be to establish the programmatic, technical, risk, and implementation approach in the current environment where significant attention is paid to cost performance for NASA projects. Engineering support for the STDTs will be provided by the ExEP Program Office. Among the products to be delivered by each STDT, working with the Exoplanet Exploration Program Office, will be a Design Reference Mission that includes:

1. Science requirements for a direct imaging exoplanet mission that are traceable to the recommendations of Astro2010.
2. Observatory performance requirements that meet the science objectives.
3. A detailed observatory concept in support of the science and performance requirements with instrument descriptions, having sufficient detail and fidelity to be evaluated through a cost appraisal and technical evaluation (CATE).
4. Elements of a technology plan that demonstrates the needed technology can be brought to maturity by the forecasted year of a PDR and within the anticipated budget profile of the NASA Astrophysics Division.

Members of the STDT will participate in activities in support of this effort. The results of the study will be summarized in a report to be delivered to NASA and publicly shared with the

community (e.g., through the Committee on Astronomy and Astrophysics).

Call for Applications:

NASA is hereby soliciting applications from U.S. scientists to participate in one of the two Exoplanet Direct Detection STDTs. Applications are invited from individuals, not groups.

To be considered for participation in one of the Exoplanet STDTs, interested individuals should submit both a letter of application and a current 1-page CV. Application letters must be limited to three pages, with 11-pt font and 1-inch margins, and should include the following content:

- a) Describe your current involvement in the research areas of direct relevance to one or both of the Exoplanet STDTs.
- b) Describe your specific area(s) of expertise in the field of exoplanet science and/or technology development. These may include leadership positions, observational work, theoretical work, or instrumentation.
- c) Provide references to papers that you have published within the last 10 years that demonstrate your expertise in those areas.
- d) Provide a statement of your commitment to support your participation in the Exoplanet STDT from Spring 2013 through Fall 2014.

NASA will select the membership and the Chairs of the Exoplanet STDTs after reviewing the letters received in response to this call.

Application materials must be submitted electronically via email to Dr. Douglas Hudgins, NASA Headquarters, at Douglas.M.Hudgins@nasa.gov using the subject line “Exoplanet STDT Application.” Applications must be received by 11:59 PM EST on February 15, 2013.

NASA expects to select approximately 10 individuals for each of the two STDTs (20 individuals total) and plans to announce its selections by March 31, 2013. The activities of the Exoplanet STDTs will kick-off with a face-to-face meeting to be held in Pasadena, CA, May 7-8, 2013. Each Exoplanet STDTs will meet regularly by teleconference, and quarterly face-to-face meetings are anticipated over the course of the 18 month studies. Travel expenses for participating in study meetings/activities will be reimbursed by NASA. Prospective applicants need to ensure that they will have the necessary time and commitment to support their participation in the Exoplanet STDTs through Fall 2014.

Thank you for your interest in participating in the NASA Exoplanet Science and Technology Definition Teams.

Regards,

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