

D.13 LISA PREPARATORY SCIENCE

NOTICE: Amended on March 14, 2018. This amendment delays due dates in anticipation of power loss to New England as a result of the upcoming storm. The NOI due dates for D.13 [LISA Preparatory Science](#) has been changed to Monday March 19, 2018.

This program requires a Notice of Intent (NOI). Proposals that are not preceded by the mandatory NOI may be returned without review. No feedback will be provided in response to the NOI.

1. Scope of Program

1.1 Overview

NASA is partnering with ESA on the ESA-led Laser Interferometer Space Antenna (LISA) gravitational wave observatory. LISA will detect gravitational waves in the milli-Hz band, opening a new window to study the Universe. LISA will measure gravitational radiation from a variety of astrophysical sources including the mergers of massive black holes, the capture of stellar-remnant black holes by galactic center black holes, close compact binaries in our own galaxy, and other potential sources. More information about the LISA mission can be found at <https://www.lisamission.org>.

NASA's contributions to LISA are still being discussed with ESA, but they are expected to include elements of the instrument payload, elements of the observatory and spacecraft, and aspects of operations, science data analysis, and interpretation. The LISA Consortium has developed an initial set of Work Packages (WPs) detailing specific areas of work, and related tasks, to identify work required to build necessary data processing infrastructure to deliver core LISA science. The WPs can be accessed via <https://lisa.nasa.gov> and related links. While the development of hardware and ground-segment infrastructure is supported by NASA through NASA's LISA Study Office at Goddard Space Flight Center, this ROSES element concerns the support of U.S.-based investigators for developing data analysis tools and modeling to prepare for the analysis and interpretation of the LISA data within the framework of the WPs, or in augmentation of them.

1.2 Program Objectives

The LISA Preparatory Science (LPS) Program has been created to provide support for U.S. investigators involved in analysis and interpretation of simulated LISA data. It is not intended as a vehicle for requesting funds to support hardware work, which is funded separately, or to develop mission concepts.

Proposals to the LPS Program may request support for:

- Performing high-fidelity simulations of the expected waveforms for LISA sources;
- Developing data analysis and statistical techniques useful for the extraction of scientific measurements from LISA data (e.g., parameter estimators, etc.);
- Developing prototype data analysis tools, including innovative

- approaches to instrument simulation, that take into account the anticipated LISA mission performance;
- Evaluate the capability of LISA data for enabling astrophysics investigations;
 - Conduct astrophysics investigation that prepare for the analysis and interpretation of the LISA data.

Note that the LISA Study Office is responsible for NASA's role in designing the overall Science Ground Segment. More information on the current activities of the Study Office can be found at <https://lisa.nasa.gov>. Proposals must ensure the proposed investigations do not duplicate these activities.

Proposals to the LPS program may not:

- address topics that are predominantly theoretical in nature. Such proposals should be directed to the mission-specific programs or the Astrophysics Theory Program (ATP) described in program element D.4 of this solicitation;
- consist primarily of data reduction or analysis of archival data other than that in direct support of LISA-centric investigations. Such proposals should be directed, as appropriate, to the mission-specific programs or the Astrophysics Data Analysis Program (ADAP) described in program element D.2 of this solicitation;
- consist primarily of new astronomical observations. Such proposals may be directed to the mission-specific Guest Observer programs;
- propose to develop technologies or experimental concepts for LISA;
- request support for organizing and/or hosting scientific meetings; or
- request support for substantial computing facilities or resources (Note: Requests for personal computers, at amounts typically under \$5K, will be allowed, so long as they are used predominantly for the research being proposed).

1.3. Availability of High-End Computational Resources

Those investigators whose research requires high-performance computing should refer to the *Summary of Solicitation*, Section I(d), "NASA-provided High-End Computing Resources." This section describes the opportunity for the successful procedure that proposers must follow to apply for computing time on either of two NASA computing facilities at the Goddard Space Flight Center's Computational and Information Sciences and Technology Office or at the Ames Research Center's Advanced Supercomputing Division.

2. Programmatic Information

2.1 Types of Proposals

Proposals will only be accepted from individual Principal Investigators (PIs) whose proposed work has a clear, single focus. Individual PIs may include as many Co-Investigators and Collaborators as needed on their proposals.

Investigators may submit more than one proposal if the research program of each proposal is significantly distinct and if the implied work does not over commit the personnel involved. The proposals must state clearly what the overlap is in the proposed work and why funding of both proposals is warranted and desirable.

NASA does not anticipate awarding contracts in response to proposals submitted to this program element, because it would not be appropriate for the nature of the work solicited.

2.2 Proposal Evaluation and Awards

The three basic evaluation criteria given in the *ROSES Summary of Solicitation* Section VI(a) and the *NASA Guidebook for Proposers* are Relevance, Merit, and Cost. In addition to what is described there, the evaluation factors will include:

- a. The scientific merit of the science goals of the proposed work, specifically how they relate to or advance the goals in the LISA science case, as stated in the LISA proposal selected by ESA (<https://www.lisamission.org>);
- b. A plan for disseminating the results of the research project to the broader community and to the LISA Consortium;
- c. If development of analysis tools is being proposed, the availability and usefulness of the tools developed under the award for the astronomy and astrophysical scientific community at large for engaging in LISA science;
- d. The relationship to LISA efforts ongoing in the LISA Consortium, specifically, the relationship to the LISA WPs, and/or the level at which the proposed work complements and augments those efforts;
- e. The relationship to LISA efforts ongoing in the NASA LISA Study Office.

Proposals must address items above. To this end, a link to the LISA Consortium WPs and a set of slides highlighting the efforts funded in the U.S. by the LISA Study Office has been posted to <https://lisa.nasa.gov/>. The proposers are strongly encouraged to familiarize themselves with the WPs and the content of the slides, and address any questions to the LPS Program Officer by March 30, 2018. The questions and the answers will be collected by the Program Officer and posted on NSPIRES under the solicitation URL.

2.3 Proposal Guidelines

In addition to the required proposal elements as outlined in Table 1 of the *ROSES-18 Summary of Solicitation* the Scientific/Technical/Management section of proposals for this program element must include the following:

- A brief description of how the goals of the proposed project relate and enhance the LISA science goals;
- A description of how the proposed project complements and augments other currently funded LISA science projects of the PI, if any;
- A description of how the proposed project complements and augments parallel science efforts undergoing in the LISA Consortium (see <https://lisa.nasa.gov/>).

2.4 Proposal Requirements

To facilitate the early recruitment of a conflict-free review panel, a Notice of Intent (NOI)

to propose will be required for all submissions to this program element. Proposals that are not preceded by an NOI may be returned without review. The proposers are strongly encouraged to finalize the Team’s composition before submitting the NOIs. The NOIs are being used to recruit competent, non-conflicted reviewers, and any later changes to the Team composition would hinder this effort.

The period of performance of investigations for this research element is restricted to a maximum of three (3) years. Projects of three-year duration must be well justified, shorter duration projects are allowed.

2.5 Eligibility

All U.S.-based researchers are eligible to apply to this solicitation. In particular, LISA Study Team members and LISA Core Team members are eligible to submit proposals to the LPS program. The members currently receiving funding from the LISA Study Office, or other means, for related activities are required to add a section in their LPS proposal clarifying how the proposed LPS investigation is separate from the work already supported by the Study Office.

3. Reporting

For each year of the investigation period, the PI shall prepare a summary white paper—a document that fully articulates the science investigation to be demonstrated, the results achieved, and the application to LISA. That white paper will be submitted to the LPS Program Officer at NASA HQ, and will be made public on <https://lisa.nasa.gov>.

NASA HQ will organize a special session at the Winter 2020 AAS for LISA Preparatory Science. The PIs of the selected proposals shall give a presentation with the results of their LPS projects. Associated poster presentations are encouraged.

4. Summary of Key Information

Expected program budget for first year of new awards	~\$1M
Number of new awards pending adequate proposals of merit	~4-6
Maximum duration of awards	3 years; shorter-term proposals are welcome
Due date for mandatory Notice of Intent to propose (NOI)	See Tables 2 and 3 of this ROSES NRA.
Due date for proposals	See Tables 2 and 3 of this ROSES NRA.
Planning date for start of investigation	November 15, 2018.
Page limit for the central Science-Technical-Management section of proposal	15 pp; see also Table 1 of ROSES and the <i>NASA Guidebook for Proposers</i> .

Relevance	This program is relevant to the Astrophysics questions and goals in the NASA Science Plan. Proposals that are relevant to this program are, by definition, relevant to NASA.
General information and overview of this solicitation	See the <i>ROSES Summary of Solicitation</i> .
Detailed instructions for the preparation and submission of proposals	Please see <i>Section I(g) Order of Precedence</i> and Table 1 of the <i>ROSES Summary of Solicitation</i> and the NASA Guidebook for Proposers .
Submission medium	Electronic proposal submission is required; no hard copy is required or permitted.
Web site for submission of proposal via NSPIRES	http://nspires.nasaprs.com/ (help desk available at nspires-help@nasaprs.com or (202) 479-9376)
Web site for submission of proposal via Grants.gov	http://grants.gov (help desk available at support@grants.gov or (800) 518-4726)
Funding opportunity number for downloading an application package from Grants.gov	NNH18ZDA001N-LPS
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