



Announcement of Opportunity for Membership of the LISA Science Team

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1 INTRODUCTION

This Announcement of Opportunity (AO) solicits the participation of the European Science Community in the role of member of the Laser Interferometer Space Antenna (LISA) Science Team.

LISA was selected for study by the Science Programme Committee in 2016 as the mission to implement the science theme, *The Gravitational Universe*. Following the successful study phase, the mission was adopted by the SPC at its 175th meeting held on 25 January 2024, marking the start of the implementation phase of the mission.

The role of the LISA Science Team is to provide scientific advice during the development and operations of the LISA mission.

1.1 AO Documentation Package

[AO-D1] LISA Definition Study Report; ESA-SCI-DIR-RP-002

[AO-D2] LISA Science Management Plan

2 LISA SCIENCE OBJECTIVES

LISA is a mission designed to measure gravitational radiation over a broad band at low frequencies, from 0.1 mHz to 1 Hz; a band where the universe is richly populated by strong sources of gravitational waves. It will measure signals from a wide range of different sources that are of high relevance to the astrophysics of black hole and galaxy formation, to tests of general relativity and to cosmology, including: massive black holes mergers at all redshifts; extreme mass ratio inspirals; the inspiral of stellar-origin black hole binaries; known compact binary stars and stellar remnants; and probably other sources, possibly including relics of the extremely early Universe, which are as yet unknown.

A major objective of the mission is to determine how and when the massive black holes, present in most galactic nuclei today, have formed and grown over cosmic time. LISA will explore almost the entire mass-redshift parameter space relevant for reconstructing their evolution. The gravitational wave signal from coalescing black holes reveals their spin and redshifted mass, and the distribution of masses and spins will be studied to differentiate between different formation scenarios.

The mission will also study in detail the signals from thousands of stellar-mass close binaries in the Galaxy and give information on the extreme endpoints of stellar evolution. It will provide distances and detailed orbital and mass parameters for hundreds of the most compact

binaries, a rich trove of information for detailed mapping and reconstruction of the history of stars in our Galaxy, and a source of information about tidal and non-gravitational influences on orbits associated with the internal physics of the compact remnants themselves.

By observing highly relativistic black hole-black hole coalescences, LISA will provide exceptionally strong tests of the predictions of General Relativity. The signal from merging binary black holes, where maximally warped vacuum spacetimes travel at near the speed of light interacting strongly with each other, allow the study of the full nonlinear dynamics of the theory of gravity. By observing the signal of stellar black holes skimming the horizon of a large massive black hole at the centre of a galaxy, LISA will measure the mass, spin and quadrupole moment of the central object, testing its level of Kerrness; thus testing for the first time the black hole hypothesis and the no-hair conjecture.

More details of the LISA Science Objectives and mission design can be found in [AO-D1].

3 PURPOSE OF THE PRESENT CALL

Through the present AO, the Director of Science invites scientists based in ESA Member States to apply for membership of the LISA Science Team (LST). The LST, co-chaired by the ESA and NASA Project Scientists, will support the ESA Project and Operations teams on all aspects related to the science return of the mission.

The LST will comprise up to twenty members from European Member States and international partners, including one representative nominated by the LISA Consortium, and up to two complementary scientists, with scientific expertise which broadens the science case of the nominal LISA mission. Of the remaining seventeen members, eleven will be appointed through this announcement of opportunity, with up to six members being appointed through a similar call issued by NASA. Complementary scientists will be appointed through a future announcement of opportunity.

LST members selected through this AO will be appointed by the ESA Director of Science for a term of three years, renewable, with the Terms of Reference spelled out in Section 4. The appointment is *ad personam*. Membership is open to experts in all relevant disciplines of the LISA mission (e.g. instrumentation, data processing, astrophysics) – the composition and expertise of the LST will reflect the needs of the mission throughout its lifecycle.

The LST should reflect the diversity of the scientific community, hence we encourage applications from early career scientists and historically under-represented groups in astronomy and space science.

The LST will meet face-to-face approximately three times per year, and on a higher cadence via teleconference. Communications will be primarily through a dedicated MS Teams channel. ESA will not fund any of the selected candidates' activities related to the present appointment.

Candidates should clearly state in their proposal the source of their funding for participating to the activities implied by their membership.

The schedule for this AO is given in Table 1.

Table 1: AO schedule and deadlines

Date	Event
5 February 2024	Release of this AO
21 February 2024, 12:00 hrs (noon) CET	Mandatory Letters of Intent due
27 March 2024, 12:00 hrs (noon) CET	Proposals due
April 2024	Appointment of selected scientists

4 THE LST TERMS OF REFERENCE

The LST is chaired by the Project Scientists and monitors the correct implementation of the scientific objectives of the mission and in maximising its scientific return. The LST acts as a focus for the interests of the scientific community in LISA. Its recommendations are geared toward:

- maximising the scientific return of LISA within programmatic constraints, while ensuring that the development and operations of the mission remain compatible with its main scientific objectives;
- optimising the scientific performance of the instrument and spacecraft;
- formulating, optimising, and maintaining the gravitational wave calibration strategy;
- optimising access to the data via the mission archive(s);
- optimising the analysis and utilisation of LISA data;
- overseeing the generation of the Level-3 source catalogue from Level-2 data products;
- authorising the release of scientific data products to the community;
- establishing, when necessary, Working Groups to provide expertise to support the LISA Science Team in providing scientific advice to the Project and Mission Managers;
- establishing and managing the Science Topical Panels (STPs) of the Early Release Science Time (see [AO-D2])
- promoting public awareness and appreciation of the LISA mission, and supporting ESA and its partners in their outreach efforts.

In general, members of the LST are expected to monitor the development and operations of the mission and give advice on all aspects that affect its scientific performance. They perform

specific scientific tasks as required to discharge their responsibilities during development and operation.

5 LETTER OF INTENT

Prospective proposers must submit a mandatory Letter of Intent (LoI) by the deadline indicated in Table 1. Proposals not preceded by a corresponding LoI will not be considered. LoIs are limited in length to 2 A4 pages (minimum font size 11 pt), and their purpose is to allow ESA to perform an initial assessment of the expected range of proposals, and to prepare for the evaluation process.

Letters of Intent must be structured to contain the following information:

- Name and contact information of proposer;
- Short description of the proposer's expertise and its relevance to LISA.

6 CONTENTS OF THE PROPOSAL

Proposals submitted in response to the AO are limited in length to 8 A4 pages (minimum font size 11 pt), and must contain the following information:

- a cover letter stating the proposer's name and affiliation and explicitly mentioning the proposer's title, position, institute, address, telephone number and e-mail address (max. 1 page);
- a brief curriculum vitae also including the 10 most relevant publications (max. 2 pages);
- a description of the expertise relevant to the LISA science objectives and a statement concerning the time availability (max. 4 pages);
- a Letter of Endorsement, signed by the proposer's Head of Institute, with the endorsement to the proposer's application and the explicit support with respect to the proposed activities and the availability of resources, as needed by the proposer for the accomplishment of the LST tasks (max. 1 page).

Details of the personal data protection measures that apply to this AO can be found in the privacy notice on the submission website.

7 EVALUATION CRITERIA

The following criteria will be used (in no particular order) in assessing and evaluating individual proposals:



- Candidate's competence and experience relative to the LISA science objectives;
- The level to which the proposal identifies specific competences and addresses the contribution to the tasks described in Section 4.
- Adequacy of the time that the candidate intends to devote to activities related to the LST role.
- Adequacy of resources available to the candidate to carry out activities related to the LST role.

8 LETTER OF INTENT AND PROPOSAL SUBMISSION

Letters of Intent and Proposals should be submitted electronically in PDF format (file size not to exceed 10 MB) according to the instructions on the following webpage:

<https://www.cosmos.esa.int/web/ao-for-LISA-Science-Team>

and according to the deadlines listed in Table 1.

Applications received after the deadlines will not be considered. Applications that exceed the page limit or that do not respect the structure described above in Section 6 will not be considered.

9 FURTHER INFORMATION AND CONTACT POINTS

Requests for further information should be addressed to:

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