



Announcement of opportunity for Complementary Scientists in the LISA Science Team

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1 INTRODUCTION

1.1 Purpose and scope

This Announcement of Opportunity (AO) solicits the participation of the scientific community in the role of Complementary Scientist (CS) in the LISA mission. Through the appointment of the CSs, ESA intends to gather independent advice for optimising the exploitation of the mission by the general scientific community.

The Laser Interferometer Space Antenna (LISA) is an ESA-led mission in partnership with NASA. It aims to study the Gravitational Universe through the observation of low frequency gravitational waves. LISA is the first space mission designed to observe the Universe via gravitational waves.

The Science Programme Committee adopted the LISA mission at its meeting in January 2024, therefore the mission is now in its implementation phase.

ESA aims to appoint up to two Complementary Scientists in scientific areas complementary to the core science of the mission (gravitational waves). The CSs will be appointed for a period of three years, renewable. ESA will not fund the activities of the CSs and each proposer is responsible for securing their own funding from other sources.

The schedule for this AO cycle is given in Table 1.

Table 1: AO schedule and deadlines

| Date | Event |
|---------------------------------------|---|
| 28 November 2024 | Release of this AO |
| 22 January 2025, 12:00 hrs (noon) CET | Proposals due |
| March 2025 | Appointment of Complementary Scientists |

1.2 AO documentation package

[AO-D1] LISA Science Management Plan

[AO-D2] LISA Definition Study Report; ESA-SC-DIR-RP-002

1.3 Mission summary

A mission summary is included in Section 2 of [AO-D1]. A more detailed description of the LISA mission science objectives, science measurements and mission requirements, payload, observation strategy and management organisation can be found in [AO-D2].

The LISA Science Management Plan (SMP, AO-D1) describes the approach that will be implemented to ensure the fulfilment of the scientific objectives of the LISA mission and to optimise its scientific return, with special emphasis on payload procurement, science operations and management. The SMP also outlines the data generation approach and data policy, and how the scientific community can participate in the mission. It describes the tasks and responsibilities of LISA mission stakeholders up to the data distribution and archiving, and the principles for the publication policy and public relations.

In addition, the SMP describes the composition of the LISA Science Team (LST), including the Complementary Scientists to be appointed through this call, and provides the LST Terms of Reference (ToR).

1.3.1 Complementary Science

LISA comprises a constellation of three satellites separated by 2.5 million km, designed to detect low frequency gravitational waves through laser interferometry between the satellites. Each satellite is in an Earth-like orbit, inclined by 5° to the ecliptic plane. The constellation trails (or leads) earth by ~ 50 million km.

The mission will operate near continuously, surveying the full sky. The LISA constellation cannot be pointed. Each satellite carries, as well as the gravitational wave payload hardware, a set of six platform two-axial AMR¹ magnetometers, a radiation monitor sensitive to charged particles with energies higher than 70MeV, and a set of temperature sensors.

Complementary science is any science that is not the primary science objective of the mission (the detection of low frequency gravitational waves). Examples of complementary science using the LISA satellites may include, but is not limited to :

- Space weather
 - o LISA comprises 3 spatially separated satellites in an earth-like orbit
- Multi-messenger astronomy
 - o LISA will observe the inspiral of massive black holes weeks to months before the final coalescence. The gravitational wave signal can be utilised by electromagnetic observatories to locate and follow-up the merger/post-merger source.
- Physics beyond General Relativity
 - o LISA will measure the inspiral and merger of massive black holes with unprecedented accuracy. These high SNR signals will highlight any impacts on waveforms from exotic physics and/or environmental effects.
- Interplanetary dust/micro-meteoroids

¹ AMR: Anisotropic Magneto Resistance

- The LISA test masses are free-floating high precision accelerometers allowing the momentum transfer from impacts on the spacecraft to be measured.

2 APPOINTMENT REQUIREMENTS AND CONDITIONS

This call is open to scientists based in ESA Member States.

The CSs will join the LISA Science Team (LST), with the primary responsibility to optimise the use of LISA data by the general scientific community to achieve complementary science return. The CSs are expected to provide support to the outreach activities of ESA. In addition to the ToR described in the SMP, the CSs will advise ESA on:

- Optimising the capabilities for complementary science within the mission constraints;
- Communicating the mission capabilities to maximize the community involvement and the mission scientific return;
- Optimising the exploitation of the LISA mission data.

Candidates will have to describe in the proposals their expertise relevant to the complementary science fields which can be investigated using LISA. Candidates will also have to describe their proposed contribution to the responsibilities and tasks defined above, and the relevance of their contribution to the mission. Candidates will have to declare their time commitment to the LST activities and their willingness to take up specific and time-limited tasks as assigned by the LST. The applicants shall guarantee participation in the LST meetings (3 in person meetings per year, and monthly online meetings are expected). The proposals should include the explicit endorsement and support from their institutes.

The successful candidates will be appointed by the ESA Director of Science. The CS appointment is *ad personam*, for a period of 3 years, renewable. Each selected CS will be required to submit short annual reports of his/her LISA related activities to ESA.

The CSs will be full members of the LST with the same rights and responsibilities as the other LST members, as described in [AO-D1]. In particular, the CSs will have the same publication rights and rules as other LST members.

3 CONTENTS OF THE PROPOSAL

Proposals submitted in response to the AO are limited in length to 7 A4 pages (minimum font size 11 pt), and must contain the following information:

- A cover letter stating the proposer's name 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 scientific expertise relevant to the complementary science field, the proposed contribution to the LISA Science Team, and a statement concerning time availability (max. 3 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 facilities and infrastructure, as needed by the proposer for the accomplishment of the CS tasks (max. 1 page).

4 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 complementary science field;
- The candidate's proposed contribution to broaden the expertise of the LISA Science Team;
- Adequacy of the time that the candidate intends to devote to activities related to the CS role.
- Adequacy of resources available to the candidate to carry out activities related to the CS role.

5 PROPOSAL SUBMISSION

Proposals shall be submitted electronically in PDF format (file size cannot exceed 5 MB) according to the instructions on the following webpage:

<http://cosmos.esa.int/web/lisa-cs-2024>

and according to the deadlines listed in Table 1.

Proposers will receive confirmation upon successful receipt of their Letters of Intent and of their Proposals.

Further queries should be addressed to:

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