

# LISA Mission Status

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# LISA is Adopted!

- LISA was officially adopted as an ESA mission at the SPC meeting on January 25<sup>th</sup> 2024.
- Launch date: second half of 2035.
- With adoption
  - LISA becomes a secure mission;
  - Significant increase in funding from both ESA and the member states;
  - organization is formalized.
- Adoption supported by various documents
  - **Red Book:** describes mission as adopted and its science objectives.
  - **Science Management Plan:** describes organization of scientific data delivery.
  - **Science Implementation Requirements Document:** describes how scientific data will be delivered.

→ THE EUROPEAN SPACE AGENCY



SCIENCE & EXPLORATION

## Capturing the ripples of spacetime: LISA gets go-ahead

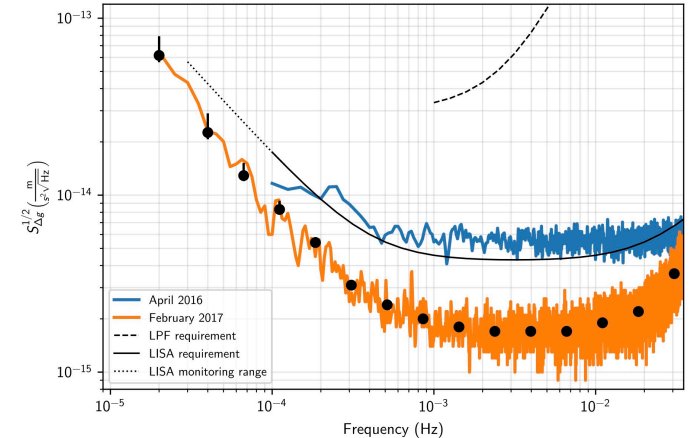
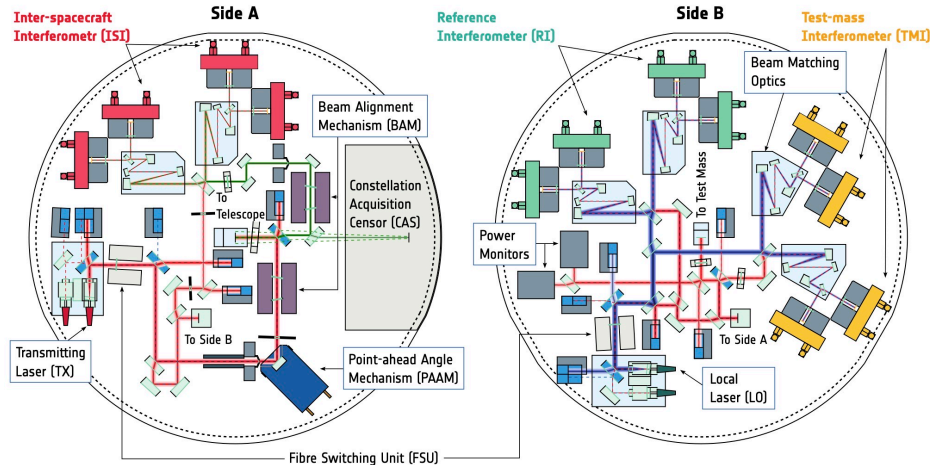
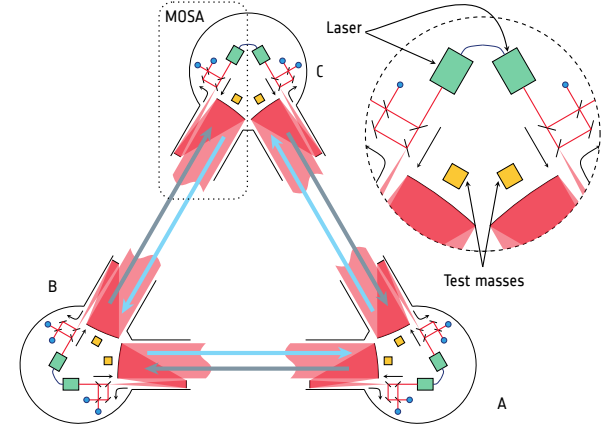
25/01/2024 41968 VIEWS 201 LIKES

ESA / Science & Exploration / Space Science

Today, ESA's Science Programme Committee approved the Laser Interferometer Space Antenna ([LISA](#)) mission, the first scientific endeavour to detect and study gravitational waves from space.

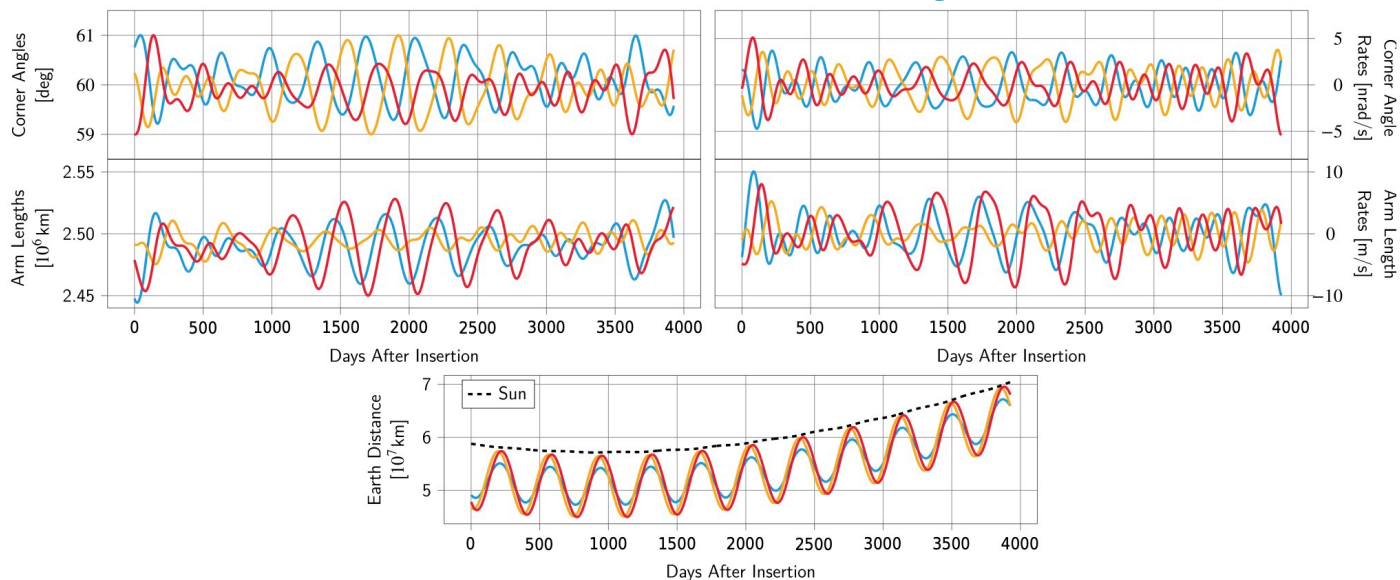
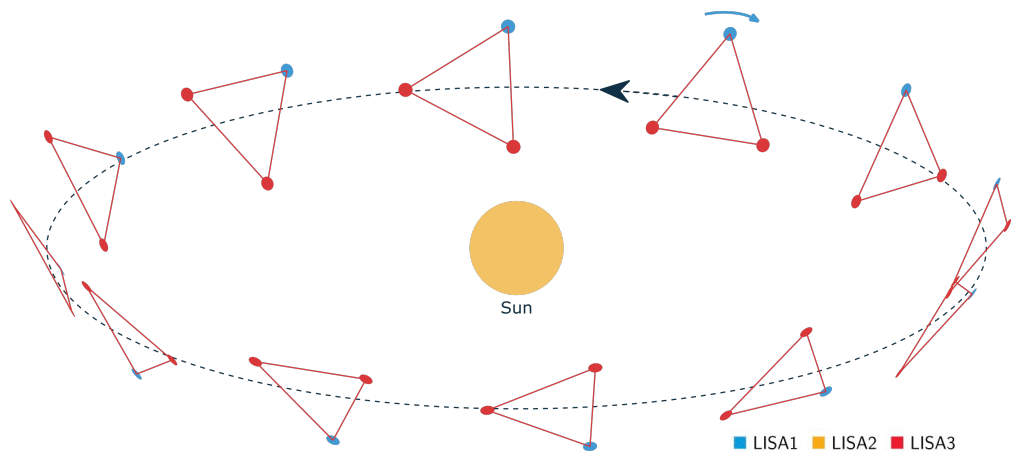
# LISA as adopted

- LISA will measure test mass to spacecraft and spacecraft to spacecraft distance in each direction along each arm.
- Heritage for **Gravitational Reference Sensor** and **Optical Bench** comes from LISA Pathfinder.
- The **Moving Optical Sub-Assembly (MOSA)** on which the telescopes and optical benches are mounted, were not tested with LPF.



# LISA as adopted

- LISA will follow the usual cartwheeling orbit.
- Average armlength  $\sim 2.5$  M km with  $\sim 2\%$  fluctuations.
- Constellation between 50 and 70 M km from Earth in first ten years – gradually drifts away.

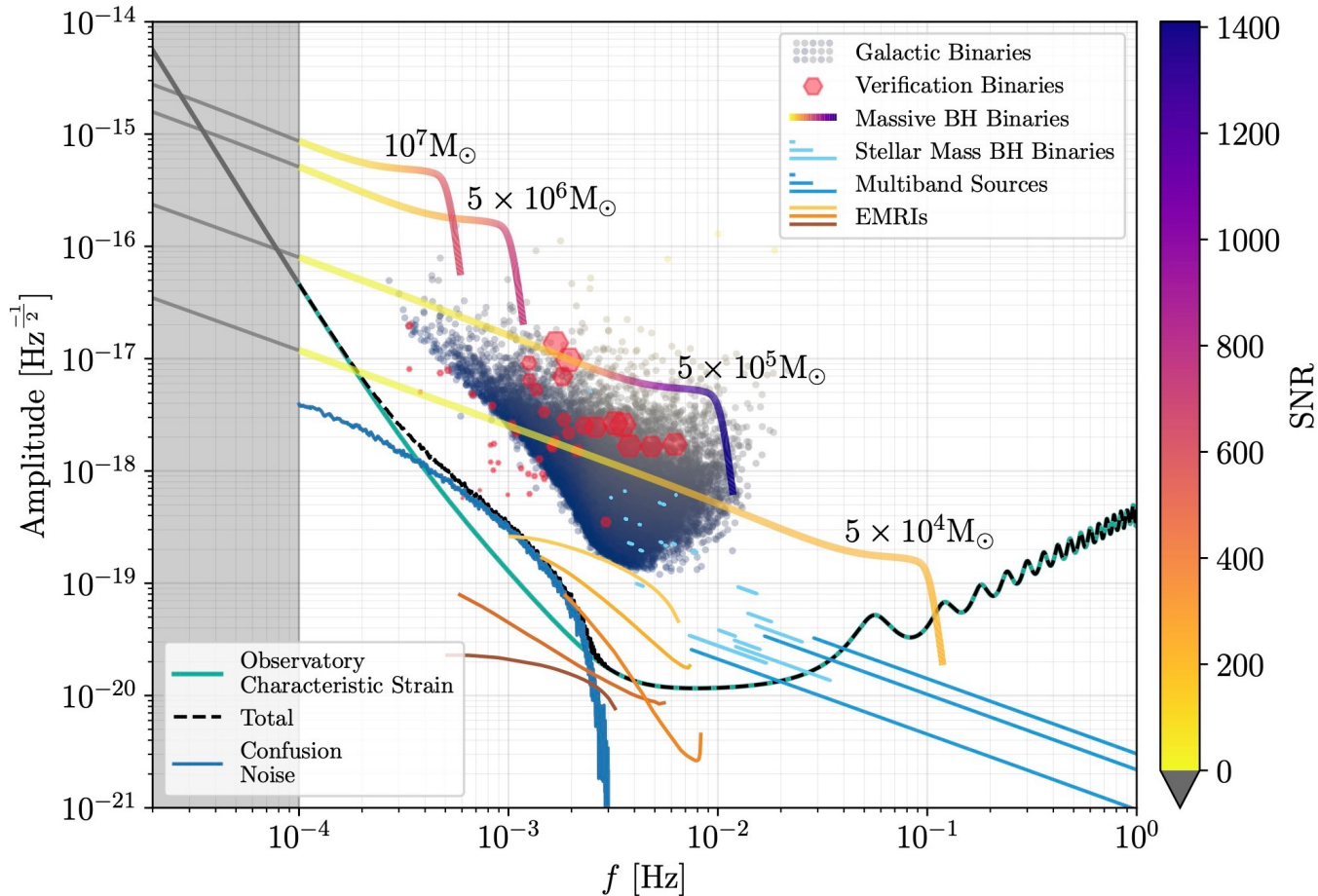


# LISA as adopted

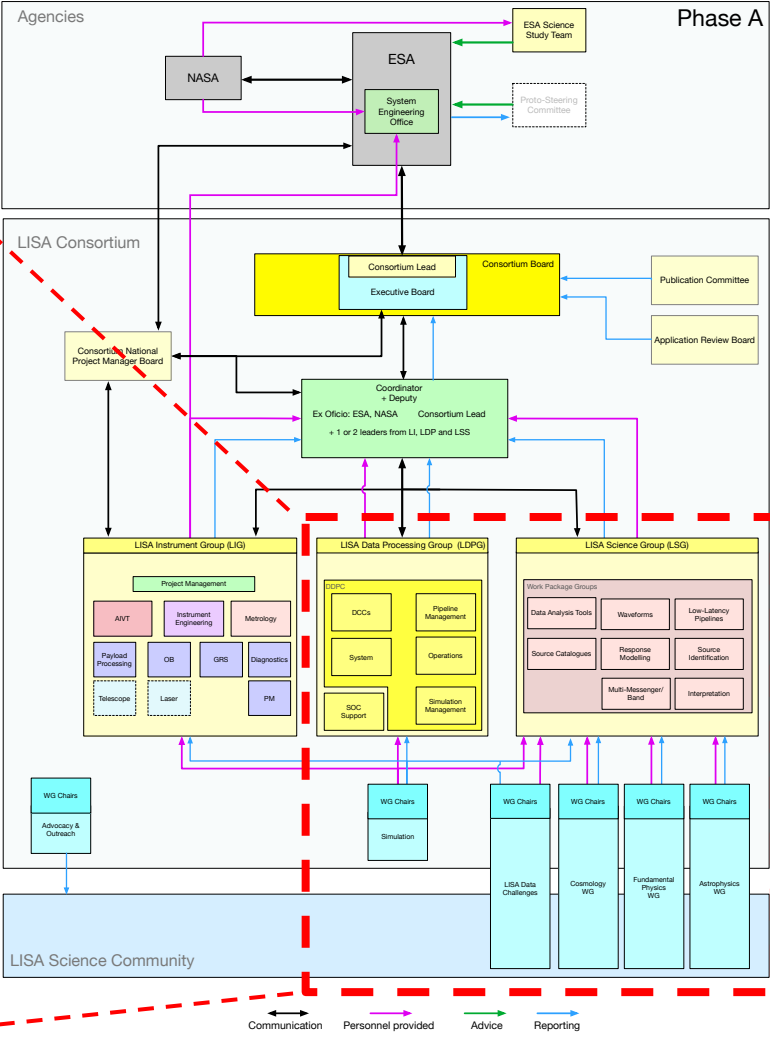
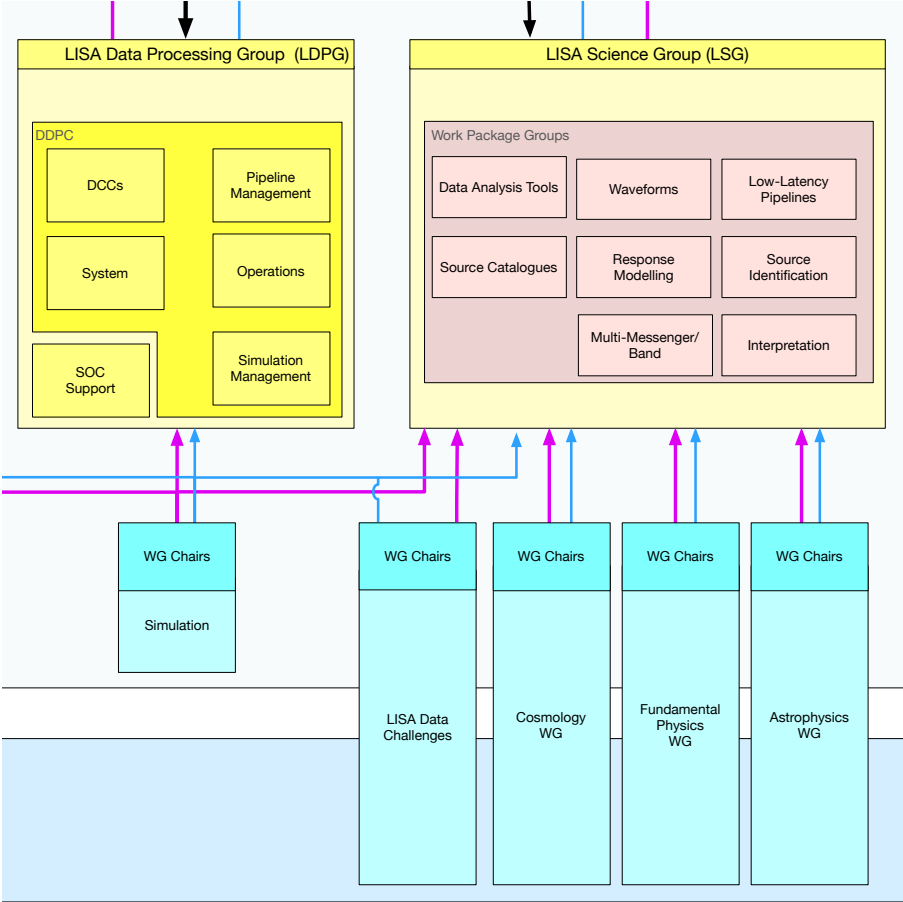
Red Book identified 8 Science Objectives for LISA.

These will be covered in Carlos' talk later.

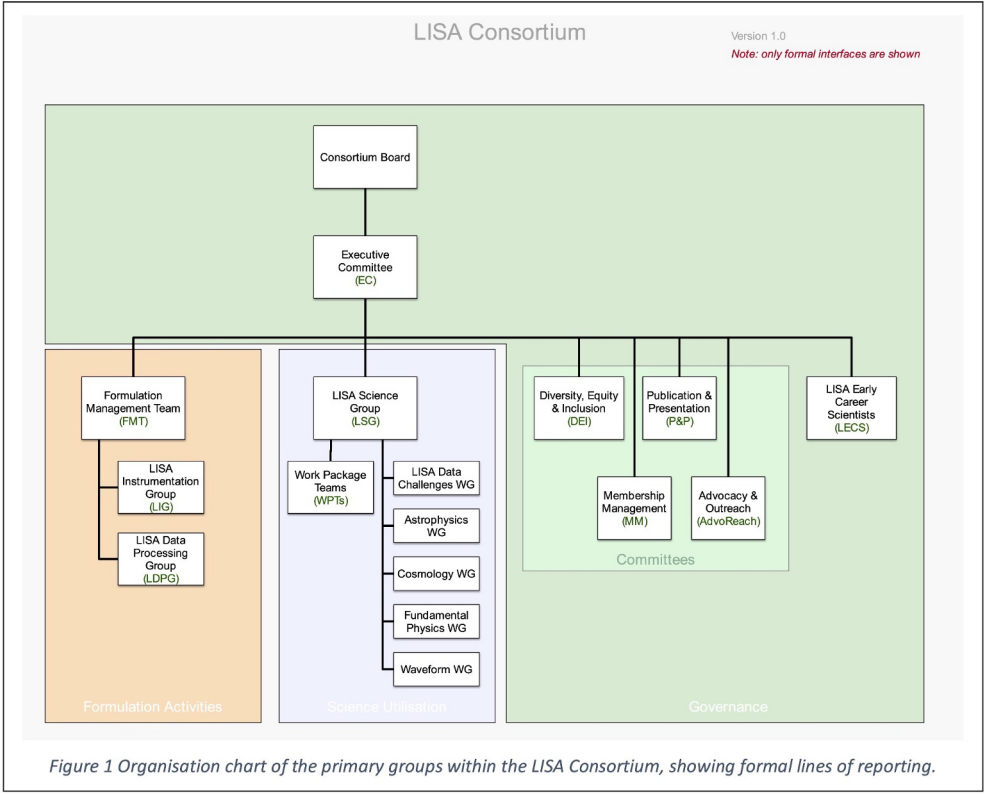
I will focus on organizational issues.



# Evolution of organization: phase A



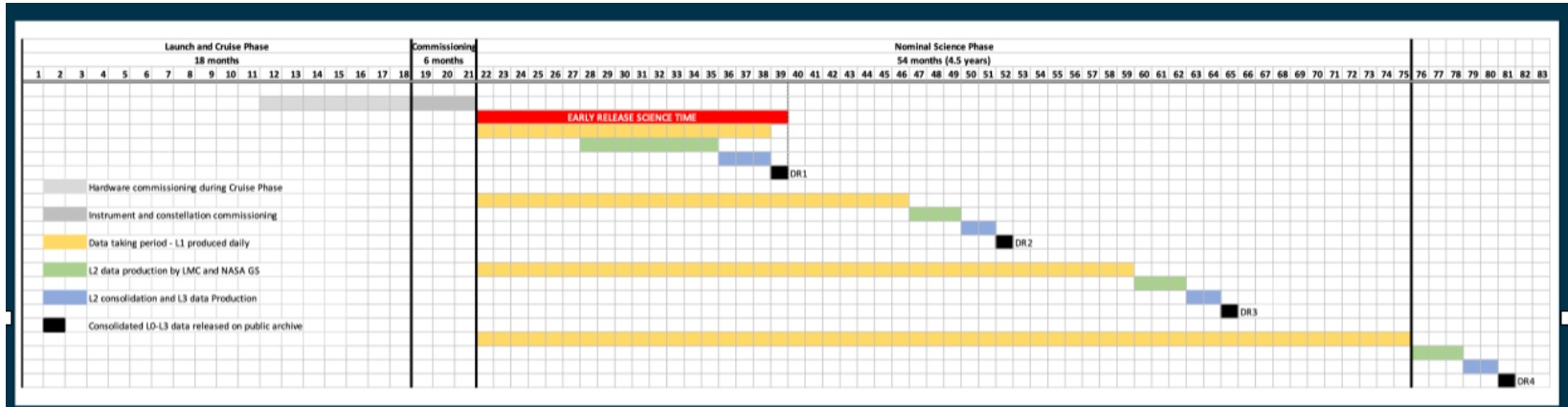
# Evolution of organization: phase B1



# Evolution of organization: plans for data releases

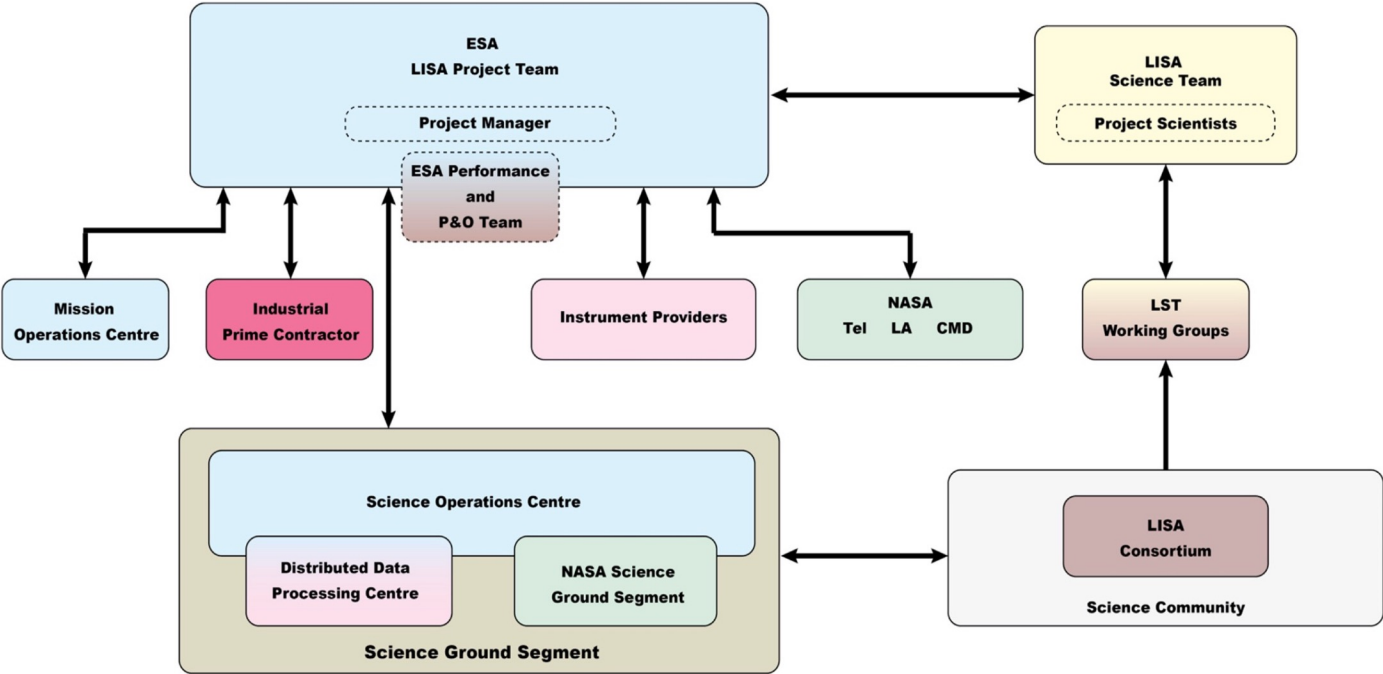
## Key provisions of Science Management Plan

- The first LISA data release will take place 1 year after the start of scientific data taking.
- The data release will be accompanied by a catalogue of sources, produced by the European Distributed Data Processing Centre (DDPC) and the NASA Science Ground Segment (NSGS).
- Science will be done during this Early Release Science Time (ERST), by a set of Science Topical Panels (STPs), openly selected prior to data taking. Key science papers will also be written in ERST.
- The appointment and management of the STPs and the writing of the key science papers will be the responsibility of the LISA Science Team (LST), which will be appointed by ESA and NASA.
- Subsequent data releases every 6 months, accompanied by updated catalogues and documentation. No further science interpretation will be done on data that has not been publicly released.



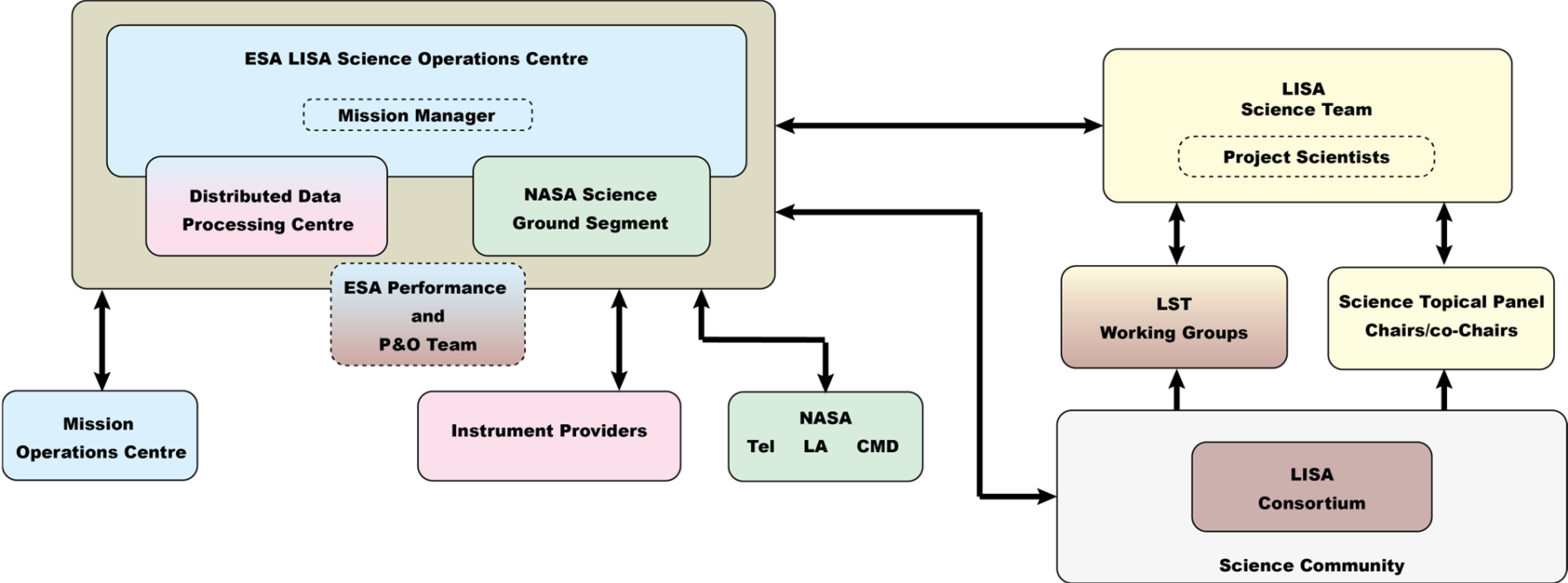


# Evolution of organization: phase B2 (post-Adoption)



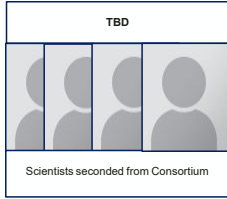
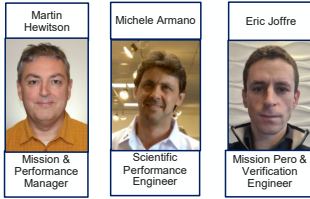
- ESA LISA Project
- ESA Science Team
- Member State Contributions
- NASA Contributions
- Combined ESA MS and NASA
- Non-LISA project activities

# Evolution of organization: after launch

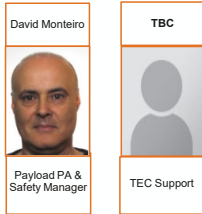


# Organization at ESA

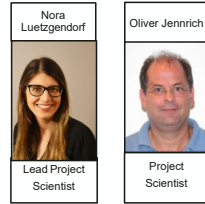
## MISSION & PERFORMANCE



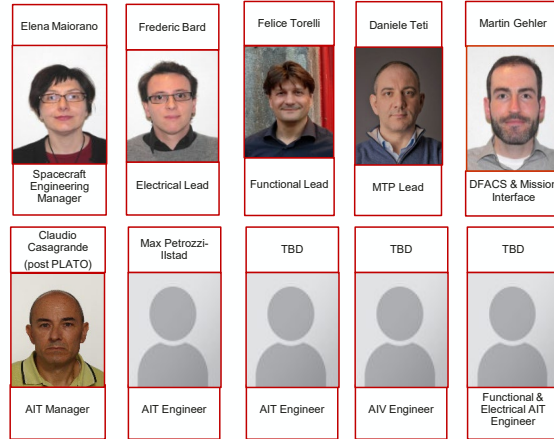
## PA & SAFETY



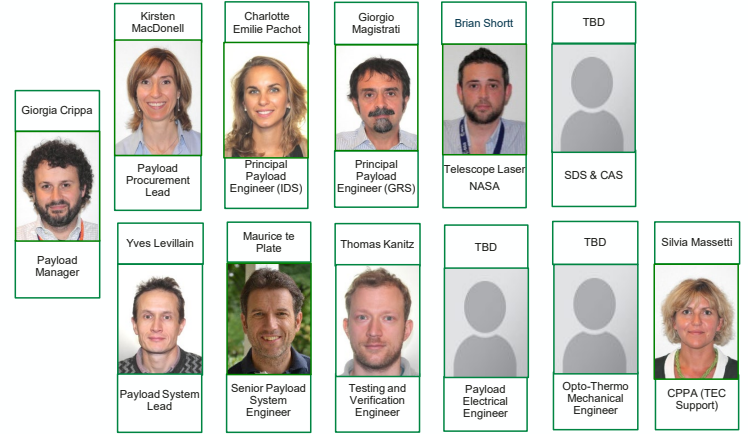
## SCIENCE



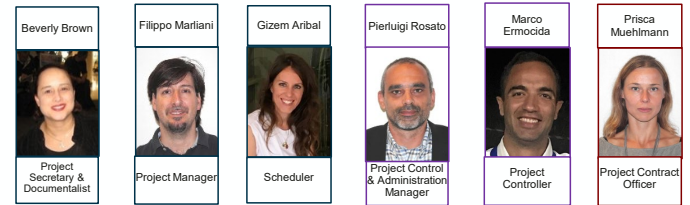
## SPACECRAFT & AIT



## PAYLOAD



## PROJECT OFFICE



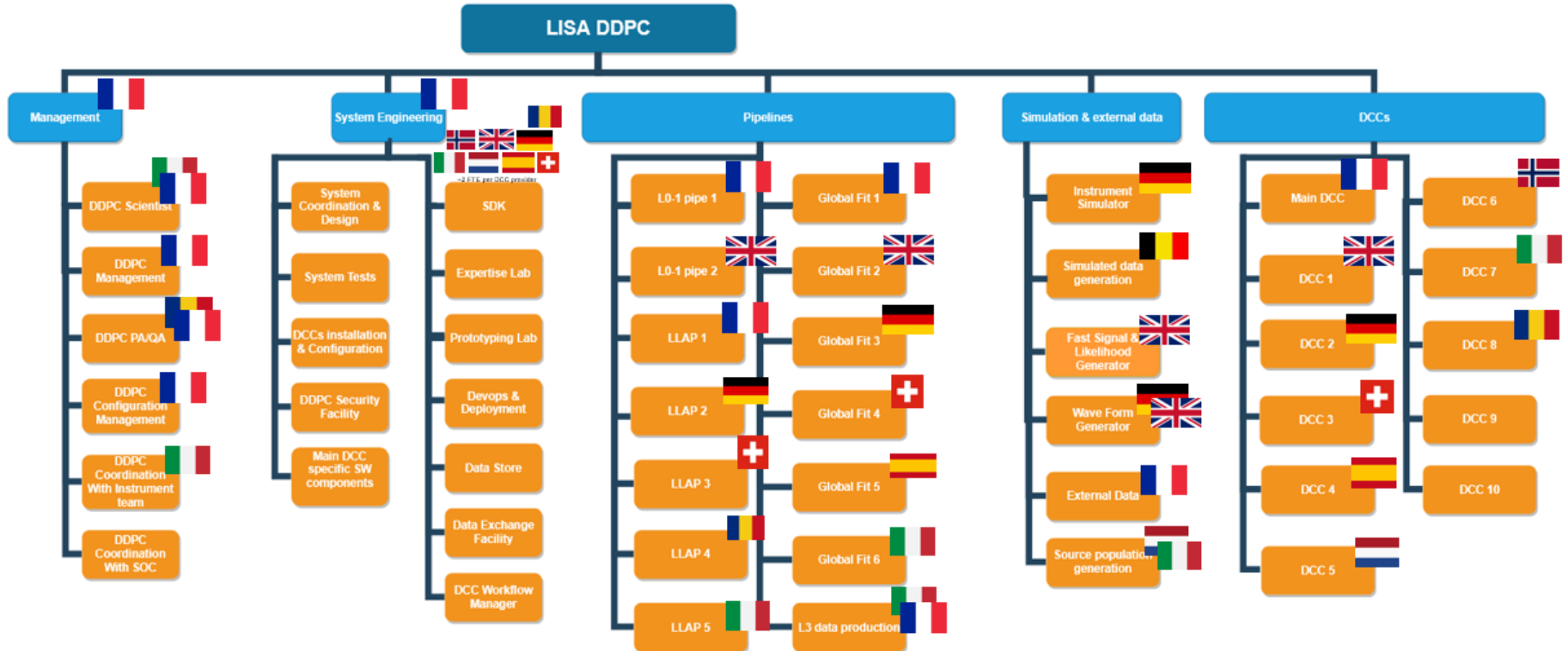
# Organization at ESA

Plans on the ESA (Hardware and P&O side):

- Now started ***implementation phase***.
- Assembly of project team started in summer 2023 and is continuing.
- Recently, focus has been to prepare the industrial *Invitation to Tender* (ITT)
  - This is the Statement of Work and System Requirements for the procurement/production of the LISA spacecraft.
- The ITT was released at the end of March. Proposals are due at the start of August.
- Assessment by the Tender Evaluation Board will run until October.
- Following this there will be a selection and negotiation period.
- Aim to select prime by the end of the year and then start Phase B2.
- Co-engineering with member state hardware teams will take place in first half of 2025.

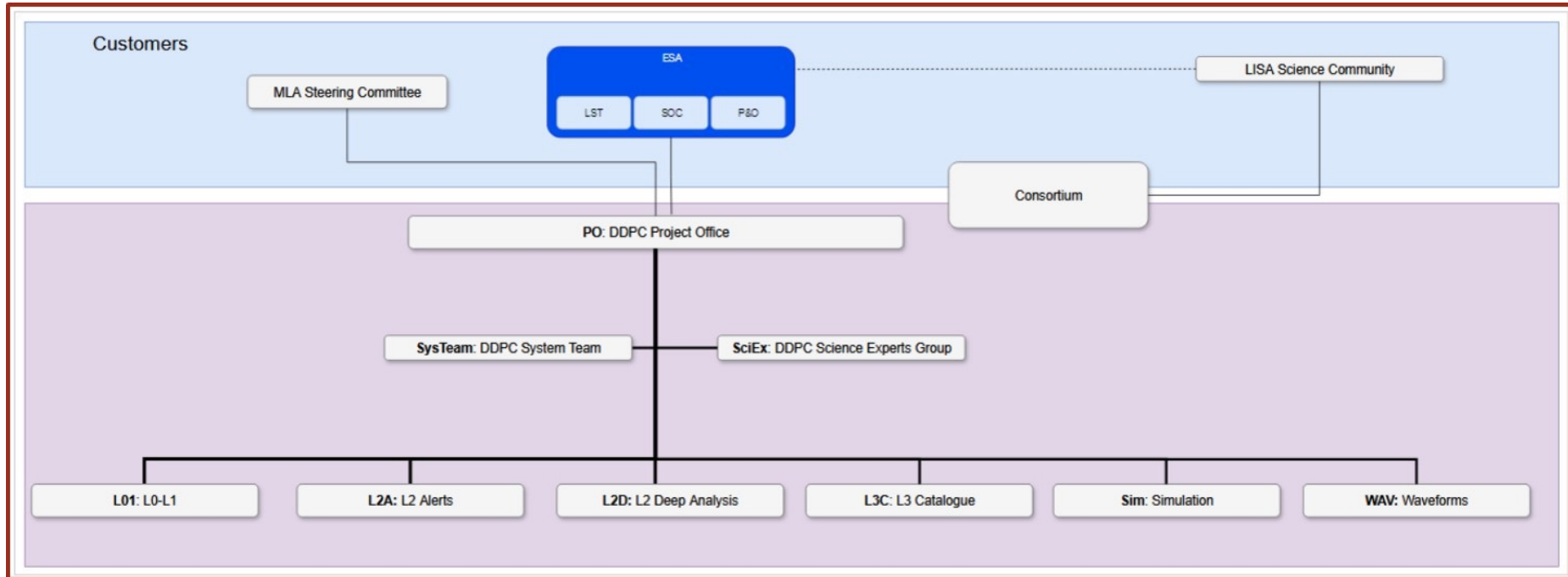
# DDPC organization

- DDPC contributions are covered by the Multilateral Agreement (MLA).
- Modifications are possible, and new member states can be added (e.g., Portugal, Finland, Canada).



# DDPC organization

Main DDPC components are organized into **Coordination Units**. Each CU has a Lead, Science Deputy, Technical Deputy and PAQA Manager. The Science Expert group brings the CU Leads together.



# Evolution of organization: consortium

The need for a Consortium that represents the wider LISA scientific community is also recognized in the SMP:

The LISA Consortium is an organisation which represents the knowledge, capabilities and interests of the larger scientific community. The LISA Consortium internal structure and participation mechanisms are not regulated by ESA.

The LISA Consortium provides an organizational forum beyond the working groups and Science Topical Panels set up by the LST. It will set up science interest groups which focus on scientific topics which are either not represented in one of the working groups of the LST or will require integrated data sets well beyond the first data release. In addition, it will provide a pool of scientific expertise that can be drawn on as needed to support the implementation of the SGS and the P&O activities. Depending on the number, type and size of the LST working groups, the LISA Consortium might also set up larger science interest groups outside the LST WGs to provide pathways for early career scientists to later join the LST WGs. The LISA Consortium will also publicise LISA science to the public.

The LISA Consortium will nominate a representative to serve as an ex-officio member of the LST, whose role will be to represent the interests of the scientific community working on preparation for LISA science exploitation.

# The Consortium Constituent Council

The **Consortium Constituent Council** (CCC) was established to come up with a proposal for the future vision and organisation of the Consortium. CCC Members comprise

- All current Board members.
- Representatives of current Consortium working groups, including the scientific working groups (Astrophysics, Cosmology, Data Challenges, Fundamental Physics and Waveforms); the LISA Science Group; and the Advoreach, DEI, MMT, P&P and LECS working groups.
- 20 additional members selected following an open call to the current Consortium.

The CCC chair (Jonathan Gair) was elected and the Deputy chair (Deirdre Shoemaker) nominated and then confirmed by the whole CCC.

More details can be found on the CCC wikipage : <https://wiki-lisa.in2p3.fr/CCC/CCC> and on the LISA restructure wiki page: <https://wiki-lisa.in2p3.fr/Main/LISArestructure> .

Activity has been organized around four subgroups focused on **Vision, Management, Membership** and **Engagement**. The first three are evolving into **Work Plan, Transition** and **Recognition**.



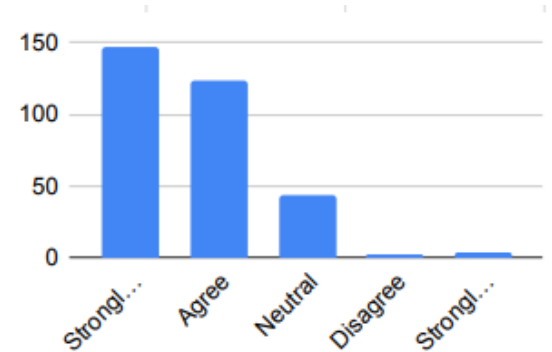
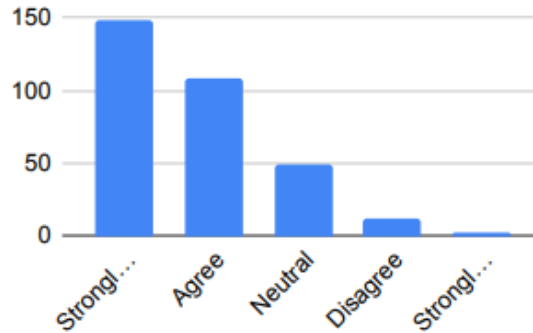
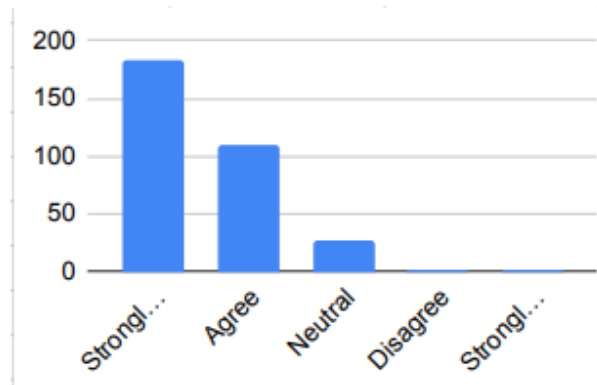
# Survey of Consortium

We had 317 responses to our survey. All overwhelming positive about the role of the Consortium, e.g., in response to the question “The evolved LISA Consortium should.....”:

Organise and coordinate interactions between instrumentalists, data analysts and scientists wanting to use LISA catalogues and data (for example waveform development).

Design and execute a strategic plan to ensure the technical success of LISA and the full scientific return from its data, complementing the work that is directly funded and managed by ESA, NASA, and the LISA member states.

Organize joint research projects and publications in advance of the LISA launch and using the open LISA data, once available.



# What is decided so far: Vision

- We agreed on this Vision for the future Consortium:
  - *The LISA consortium is a scientific collaboration working together to maximize the scientific return of LISA, in particular using the LISA data. The consortium will support all aspects of the LISA mission throughout the mission lifecycle.*
  - *The LISA consortium is committed to promoting the long term growth and development of the LISA scientific community, by providing a supportive and inclusive environment that offers training, mentoring and opportunities for scientists at all stages of their careers, in particular, early career scientists. The consortium will also engage with the wider scientific community to foster interest in and support applications of the LISA data.*

# What is decided so far: Membership

- Three categories of person
  - **Community member:** “friends of LISA”; not actively contributing. Supported by consortium through email lists and organized workshops/telecons.
  - **Full member:** contributing to projects delivering the vision of the consortium.
  - **Permanent member:** scientists who have made a significant integrated contribution.
- Full members should be active and meet some threshold of contribution. Contributions will include “onboarding” in the first two years of membership, contributions to the LISA project without which consortium work would not be possible and contributions of expertise from long-standing members.
- ***All current consortium members will have to reapply to the new consortium.*** We will also have an open call for new members. This process will be completed in two stages.
- There will be a review of proposed contributions at the time of application and subsequently at regular intervals (probably a 2 year cycle). Contributions to LST-led activities will be counted. Contributions will be assessed through deliverables, which will include service commitments and contributions to LST.
- Membership through groups, but individual memberships allowed. Small groups will be pooled. Individuals will have more direct control of their profile, and will be responsible for their own commitments.

# What is decided so far: Management

We have agreed:

- the consortium will include a management team.
- there will be a larger representative body that will direct (Council) or have input (flat model) on the decisions of the Management Team.
- there will be two Spokespeople. One will be outward looking, one will be project focussed (the LST representative).
- the spokespeople will be selected by a vote of the whole consortium.
- the management team will include representatives elected by the consortium following the same procedure as the spokespeople, and (probably) individuals representing the consortium working groups.
- the spokespeople will be part of the management team.

Not yet agreed:

- if the larger representative body will be the full consortium or a Council constructed in some way from members of the consortium. Linked to whether membership is individual or group.
- size and composition of management team.

# Implications for Cosmology Working Group

There are a few important implications for the Cosmology Working Group

- **Reapplication:** no automatic transition to new consortium. Keep an eye out for emails with instructions on how the transition will take place.
- **Work plan:** should include cosmology WG projects in preliminary work plan, as this will be the reference for people during the reapplication process. Involve CCC representative and/or CosWG chairs in work plan subgroup, or at least collect input.
- **Membership:** full/associate distinction will be changing. Work on joint projects in the work plan will be full member activity. Community members might not be as well supported as current CosWG associates, but could operate similarly.
- **Onboarding:** onboarding philosophy reduces pressure on new members to contribute immediately. Expectation that within 2 years a member is actively participating in consortium projects.