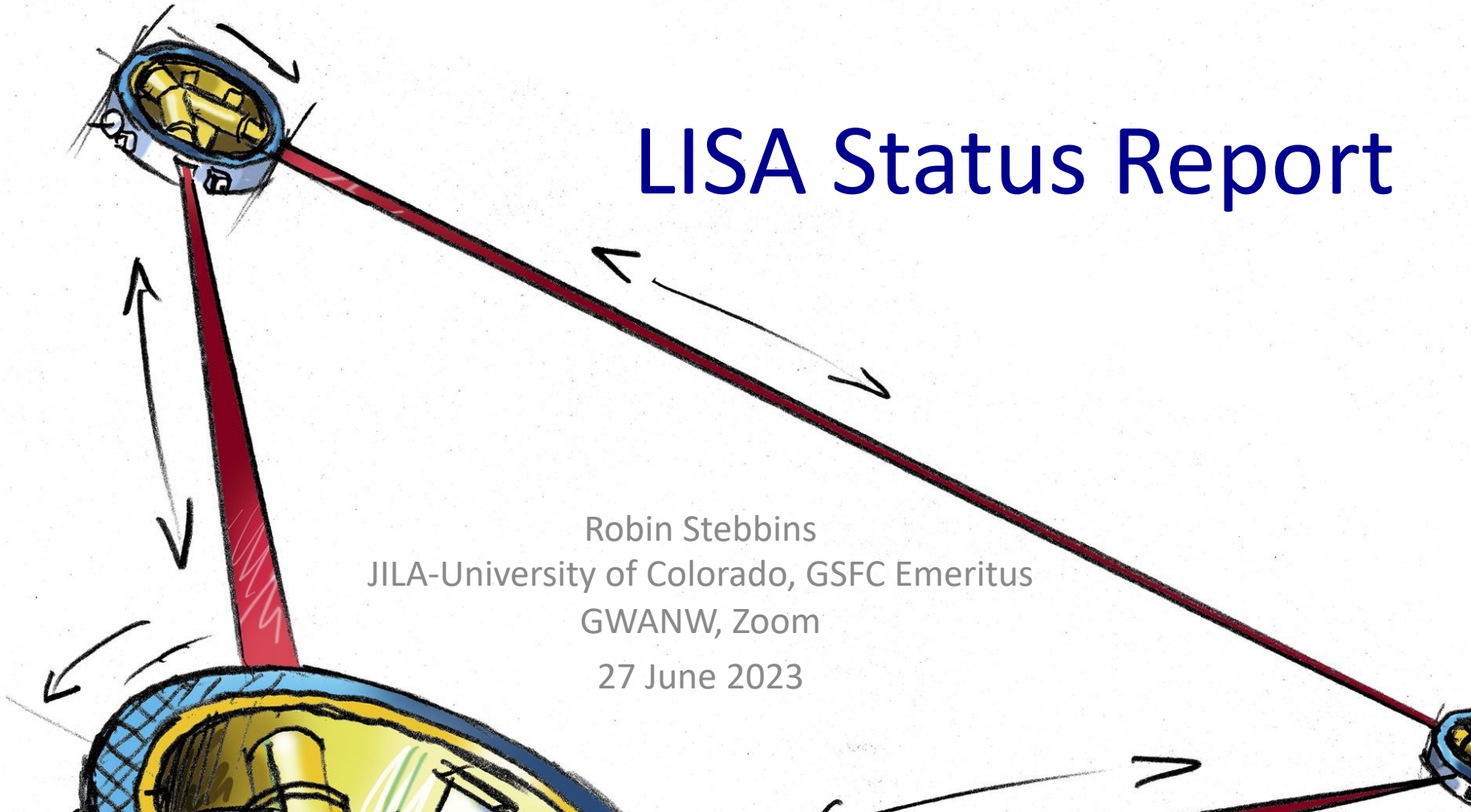


# LISA Status Report

Robin Stebbins  
JILA-University of Colorado, GSFC Emeritus  
GWANW, Zoom  
27 June 2023



# Project Status

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- The lifecycle of flight projects: Phases A, B1, B2, C, D, E and F; gateway reviews and milestones.
- The LISA Project constituents
  - Led by ESA with minority contribution from NASA.
  - ESA Study Team: Project manager, project scientists, Systems Engineering Office.
  - Two prime contractors: Airbus Defence and Space GmbH and Thales Alenia Space S.p.A.
  - LISA Science Collaboration: ~1,600 members, re-organizing.
  - ESA Science Study Team: ~13 members (Kelly Holley-Bockelmann, David Shoemaker and RTS for the US)
  - NASA Study Office (Study Manager, Study Scientist, System Engineer) and Core Team (18 primary members)
  - NASA LISA Study Team: Kelly Holley-Bockelmann, chair; +22 members
- Phase A ended in fall of 2021 with a successful Mission Formulation Review.
- Phase B1 began in May 2022 and ends with Mission Adoption Review in Dec. '23.
- Next major milestone is Adoption, a major ESA milestone between B1 and B2 where design and responsibilities are finalized, and the project plan is accepted.

# Current Events

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- Instrument Systems Requirements Review (I-SRR)
  - Reviewing the interface requirements documents between inertial reference, interferometric measurement system, telescope, laser, optical bench, charge management system, optical test system, etc.
  - Started May 15th, in progress, finish July 10th.
  - Recent changes in payload mass and volume put spacecraft over launch vehicle capability
- Project team
  - New project manager: Filippo Marliani, currently on PLATO, starts July 1st
  - Assembling new project team by early August to be ready to start procurement package
  - Drafting Joint Project Implementation Plan (JPIP)
- Science Study Team (SST)
  - Red Book – Description of mission as designed at the end of formulation. Red Team Review complete. Final writing and editing. Due mid-September.
  - Science Management Plan (SMP) – High level description of how data products are produced and released. Early draft from Coordination Office. SST has submitted multiple rounds of comments.
  - Data policy/data analysis/role of Consortium – Endless discussions, possibly settled with next SMP.
  - Science Requirements Document (SciRD) – Small amendments to antenna pattern and alerts. Due end of July.
- Agencies
  - Memorandum of Understanding (MOU) between ESA and NASA – drafts exchanged, due in November
  - Multi-Lateral Agreement (MLA) between ESA and national space agencies – drafts circulated , due in November
  - Joint Project Implementation Plan (JPIP) – details MOU between ESA and NASA , being drafted.

# Upcoming Events

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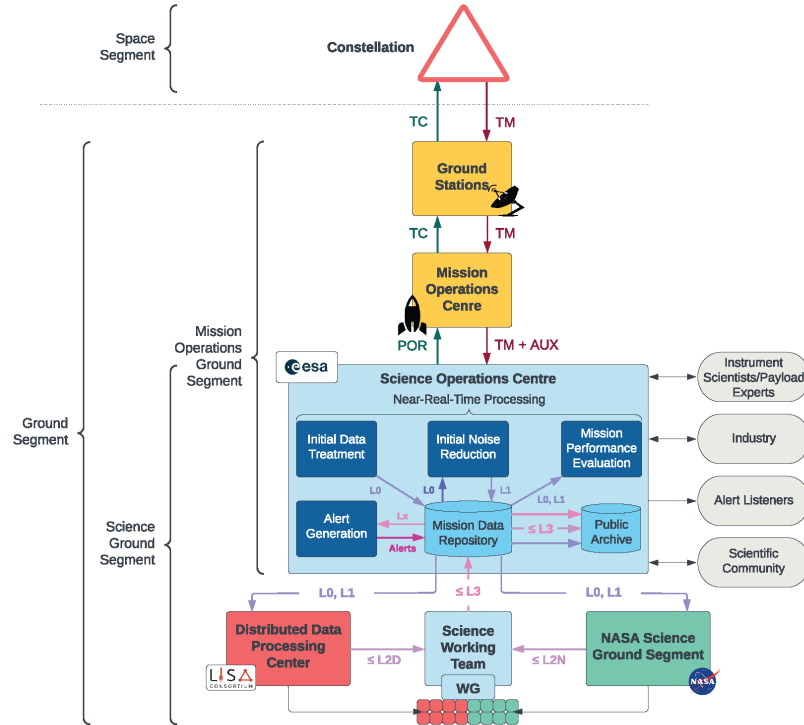
- Mission Adoption Review (MAR)
  - Agency review of the project to verify that the mission is ready for Adoption
  - August 31<sup>st</sup> to December 15th
- Science Programme Committee (SPC) pre-approval at November meeting
  - Memorandum of Understand (MOU) with NASA
  - Multi-lateral Agreement (MLA) with Member States
  - Science Management Plan (SMP)
- Adoption by SPC January 31, 2024
- Industrial procurement package – main competition between prime contractors
  - Preparation starts in Fall 2024
  - Competition, ending with selection, Q1 through Q4, 2024
  - Prime contract kick-off in Q1 2025.

# Data Policy, Data Analysis, Publications and all that...

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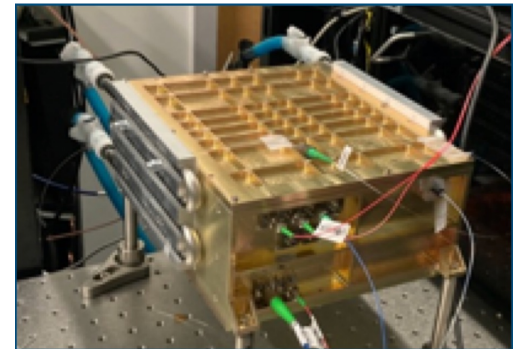
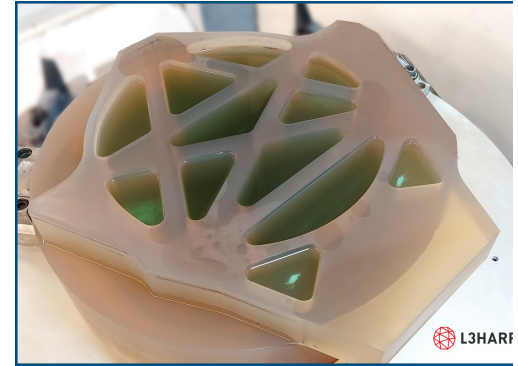
- Data policy
  - What are the deliverables? Corrected raw data, Time Delay Interferometry (TDI) variables, global fits, catalogs, code, ancillary data, more?
  - When are they delivered? How long for initial validation, privileged access, alert latency, successive releases
  - Is there privileged access? Who? Authorship of Early Science Release papers, etc.? Discovery papers after the first release?
  - Which topics are protected, which are not?
  - Who decides
- Data analysis
  - European pipelines, DDPC, etc.
  - NASA pipelines
  - Consolidation
- Non-hardware deliverables
  - Performance and Operations support
- Consortium: What is it's relation to the Project?

# Ground Segment (Red Book Draft)

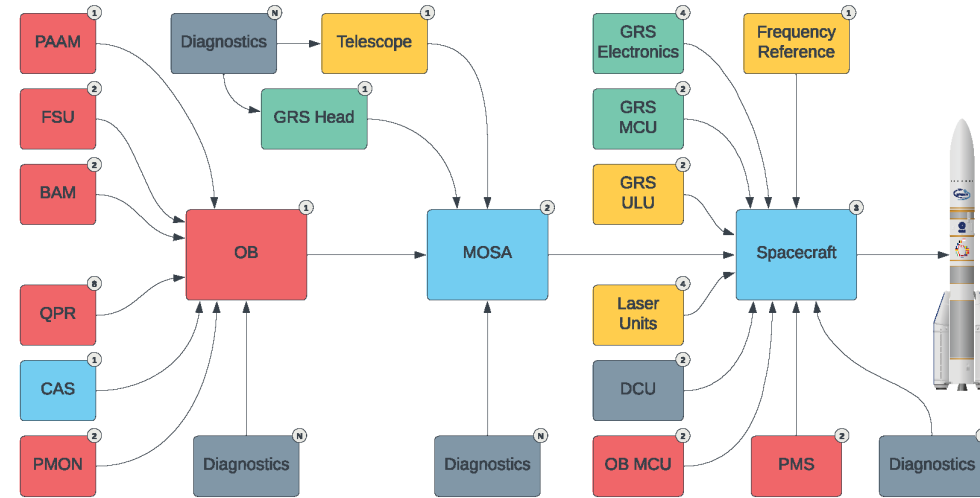


# Technology (NASA)

- Telescope – TRL 4+ (May '23 review)
  - 4-mirror design, all-Zerodur, from L3/Harris
  - Jeff Livas had severe medical issue in Dec., retiring.
  - Fabrication of STM/EDUs mostly complete
  - Minor failure in vibration testing
  - Thermal testing of structural/thermal model at UFlorida
- Lasers – TRL 5 (May '23 review)
  - Micro-NPRO with fiber amp, from GSFC, AVO Photonics and Fibretek
  - TRL4/5 head under test at Swiss lab
  - TRL6 design and build underway.
- Charge management – TRL 5 (May '23 review)
  - UV-LED system developed at UFlorida
  - Radiation testing complete, lifetime testing ongoing
  - TRL6 unit under development



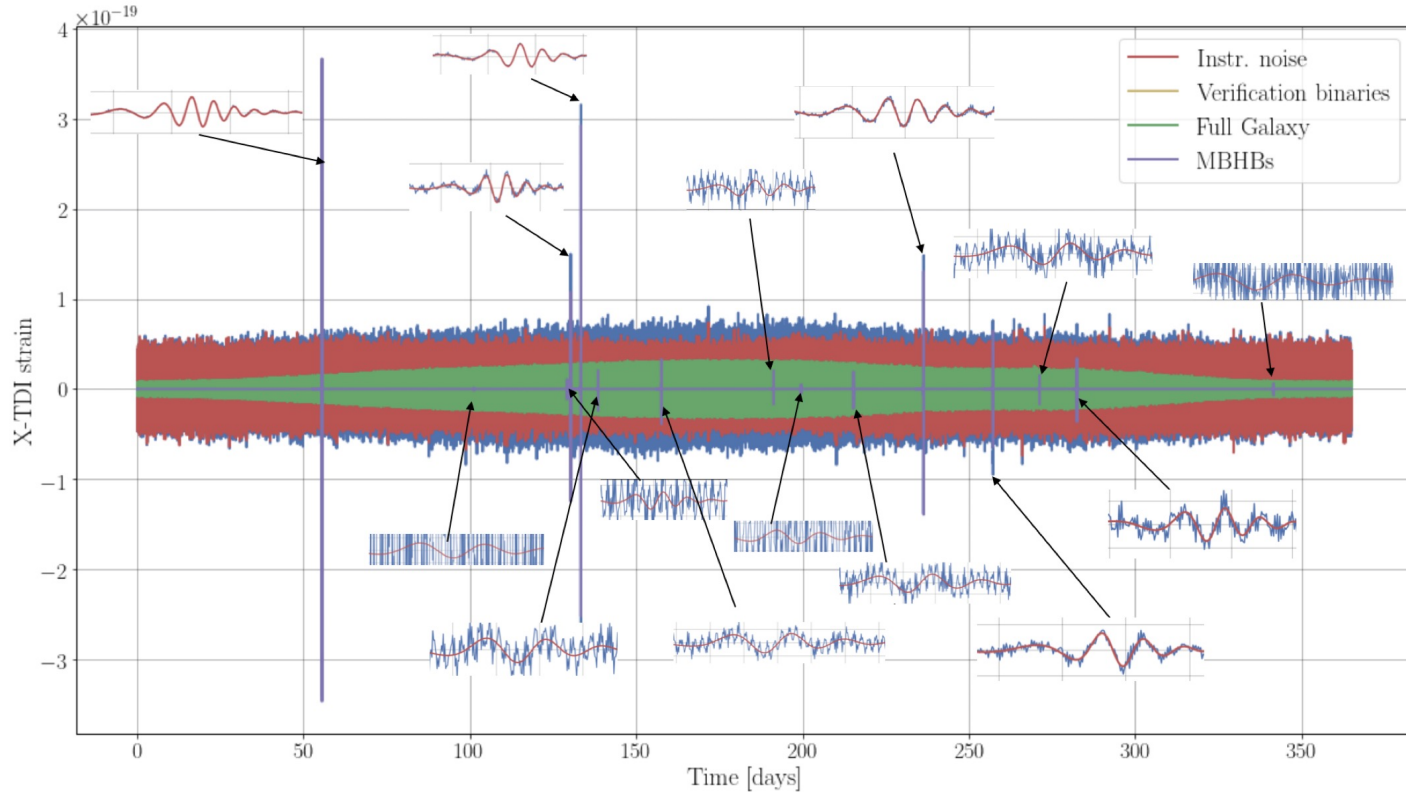
# Top Level Integration Scheme



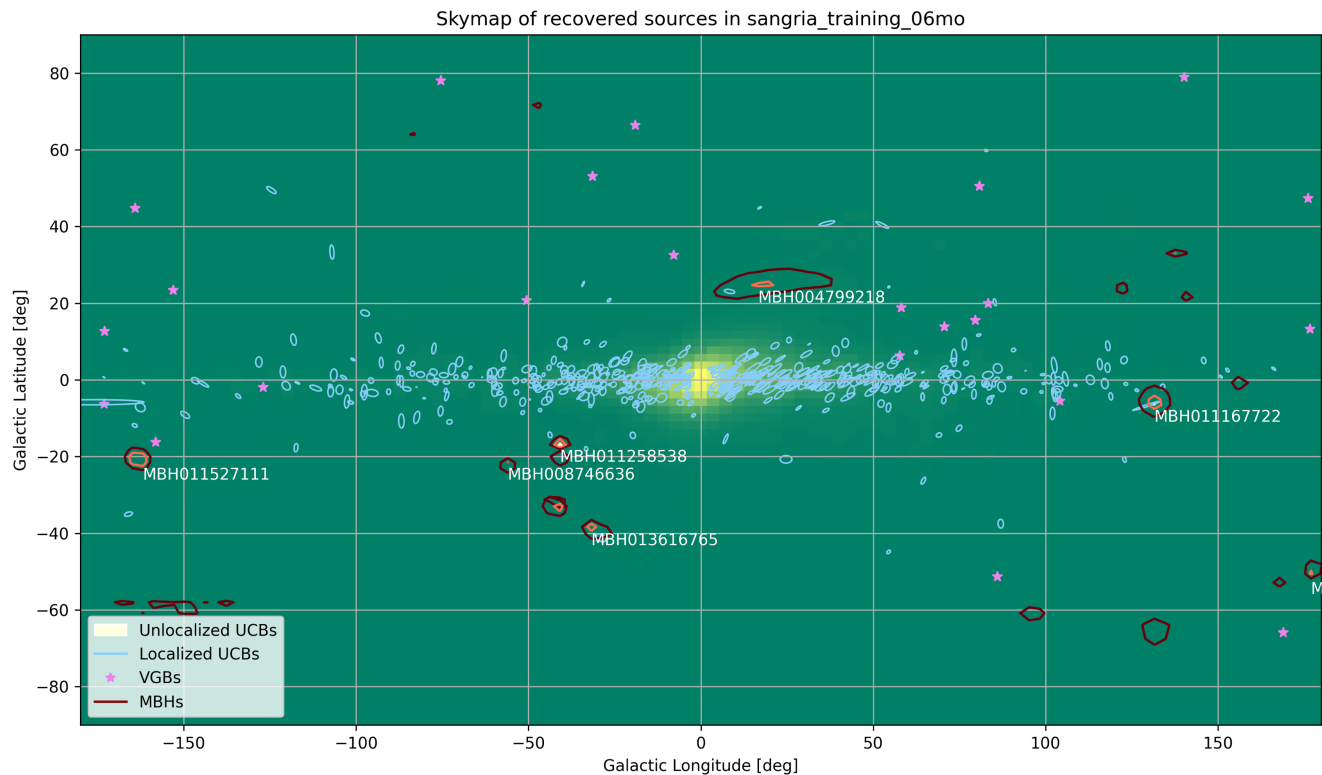
<b>IDS</b>	<b>IDS</b>	Interferometric Detection Subsystem	<b>OB</b>	Optical Bench
<b>GRS</b>	<b>GRS</b>	Gravitational Reference Sensor	<b>MOSA</b>	Moving Optical Sub-Assembly
<b>NASA</b>	<b>SDS</b>	Science Diagnostics Subsystem	<b>MCU</b>	Mechanism Control Unit
<b>ESA/Prime</b>	<b>PAAM</b>	Point Ahead Alignment Mechanism	<b>ULU</b>	Ultra-violet Light Unit
<b>SDS</b>	<b>FSU</b>	Fibre Switching Unit	<b>DCU</b>	Diagnostics Control Unit
	<b>BAM</b>	Beam Alignment Mechanism	<b>PMS</b>	Phasemeter Measurement System
	<b>QPR</b>	Quadrant Photoreceiver		
	<b>CAS</b>	Constellation Acquisition Sensor		
	<b>PMON</b>	Power Monitor		



# Simulated LISA Data



# Skymap of Recovered Sources (simulated)



## Summary

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- LISA is preparing for Adoption in Q1 2024
- Mission formulation is generally on schedule.
- Technology development is generally on schedule.
- Roles and responsibilities are firming up.
- Data policy and data analysis issues and role of Consortium are being worked out.
- Science Ground Segment planning is firming up.
- Cost containment/reduction remains a concern.
- LISA should advance to implementation in 2025.