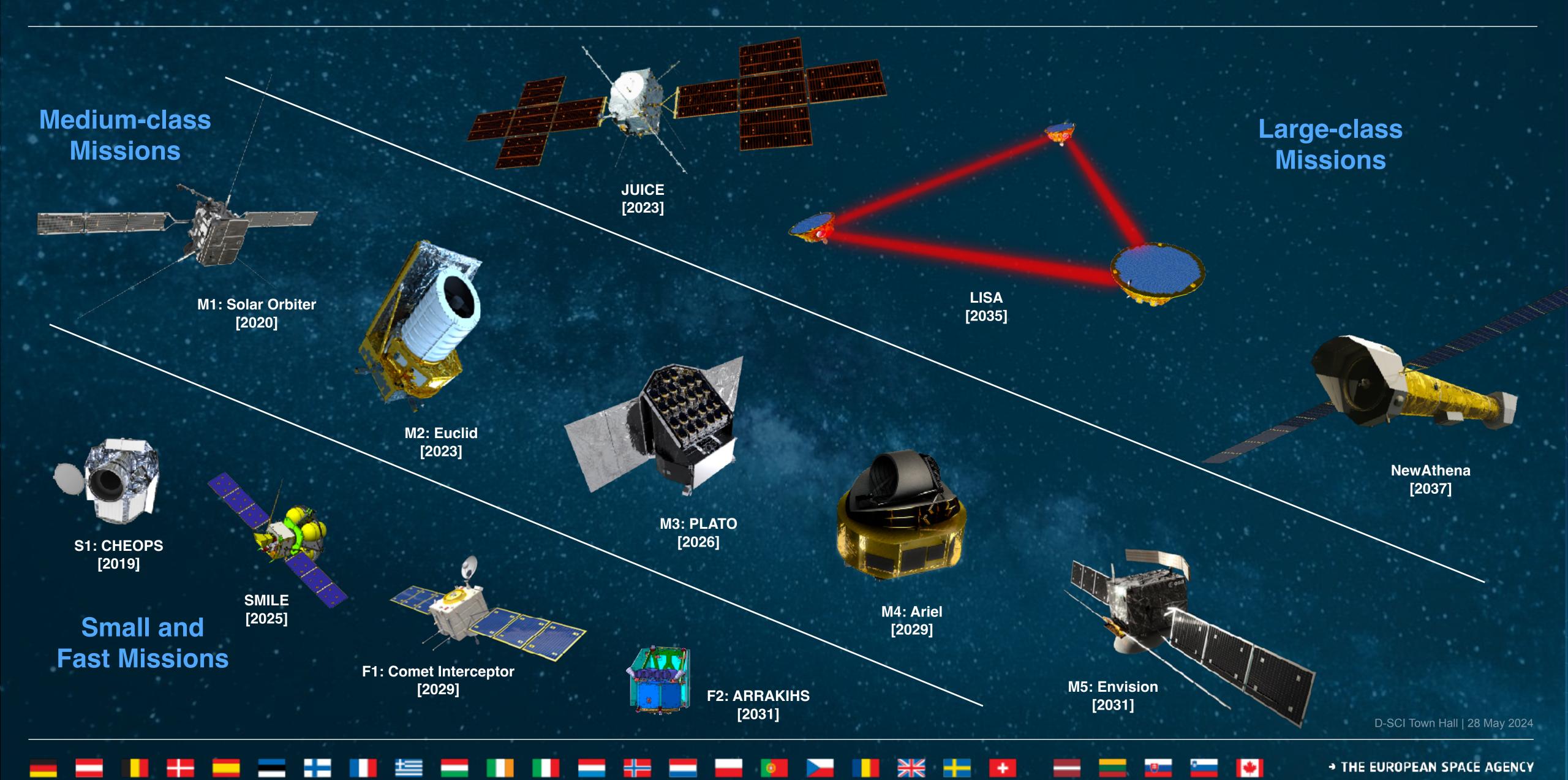


# Status and plans for Cosmic Vision - LISA and NewAthena

Astronomy and Astrophysics Coordinator
D-SCI Town Hall
28 May 2024

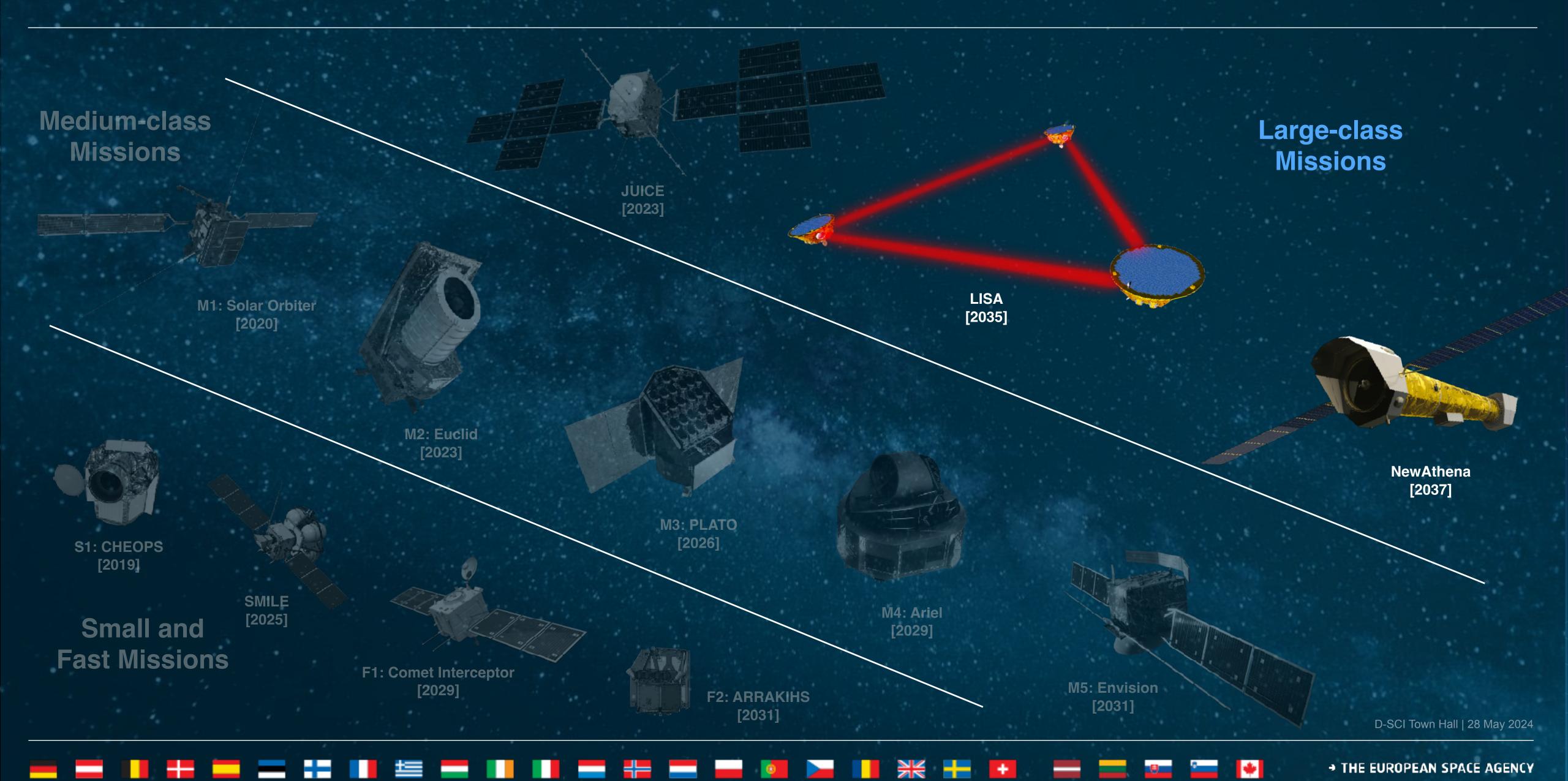
## Cosmic Vision

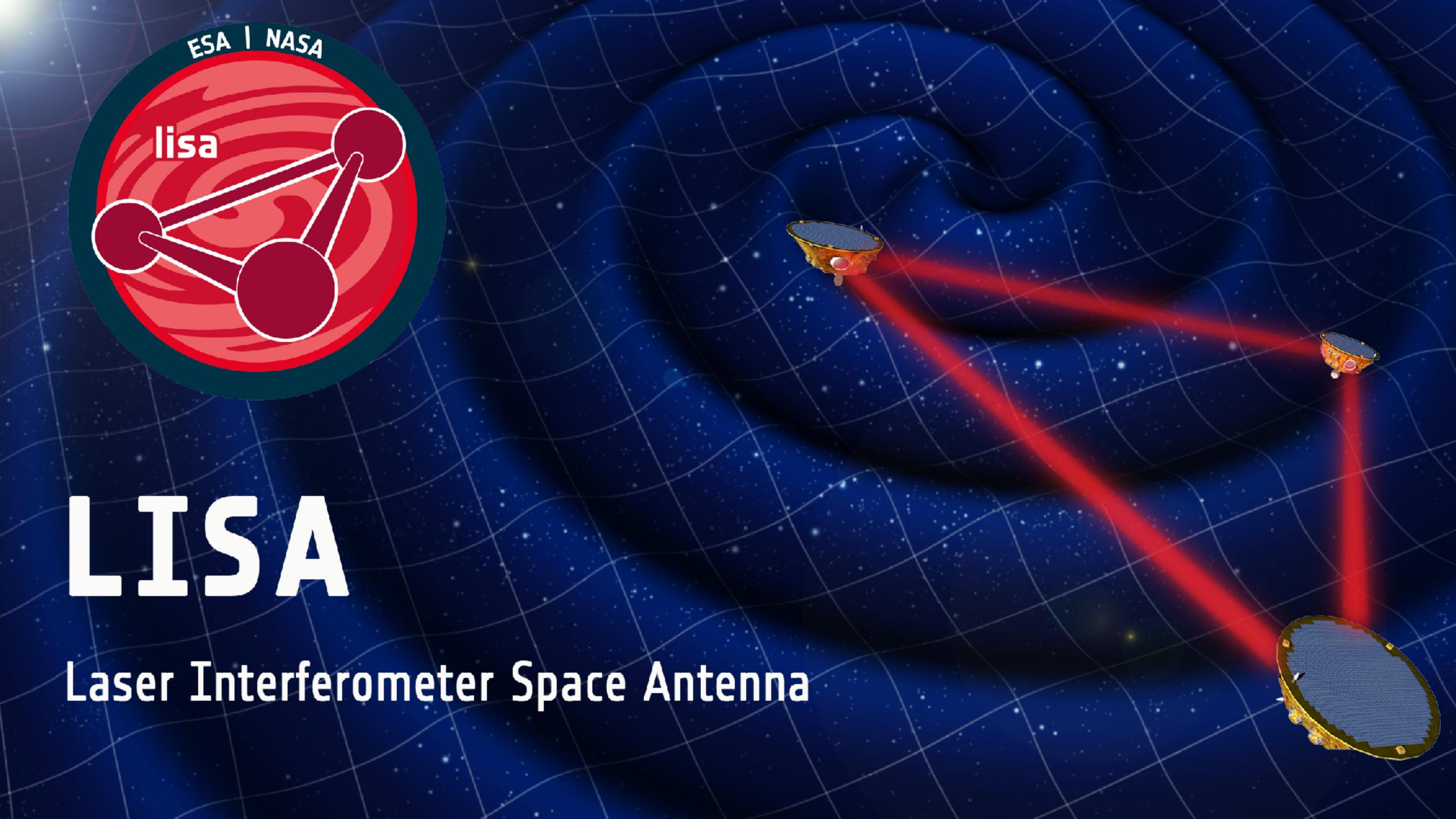




## Cosmic Vision







#### THE SPECTRUM OF GRAVITATIONAL WAVES

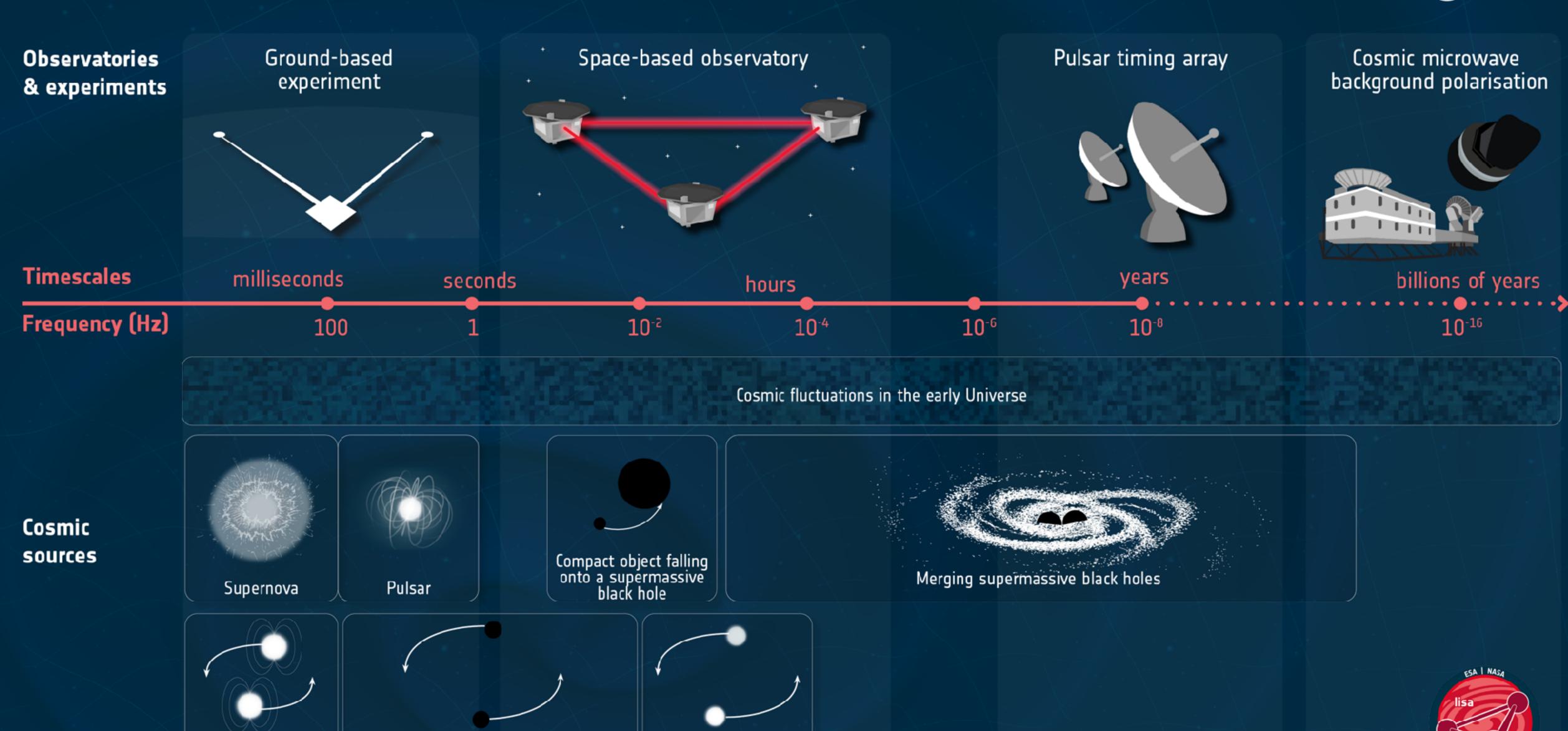
Merging neutron stars in other galaxies

#lisa

Merging stellar-mass black holes

in other galaxies



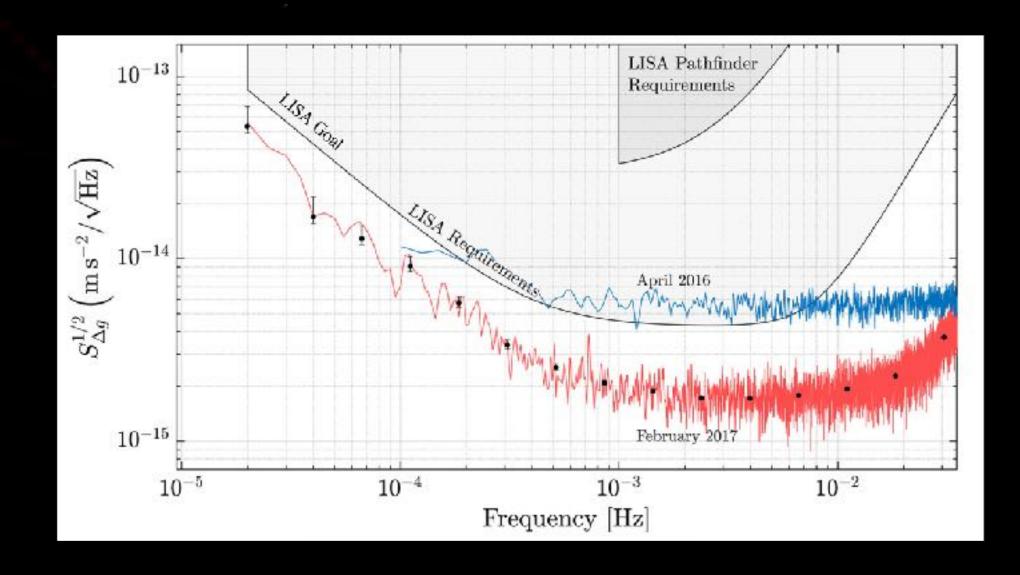


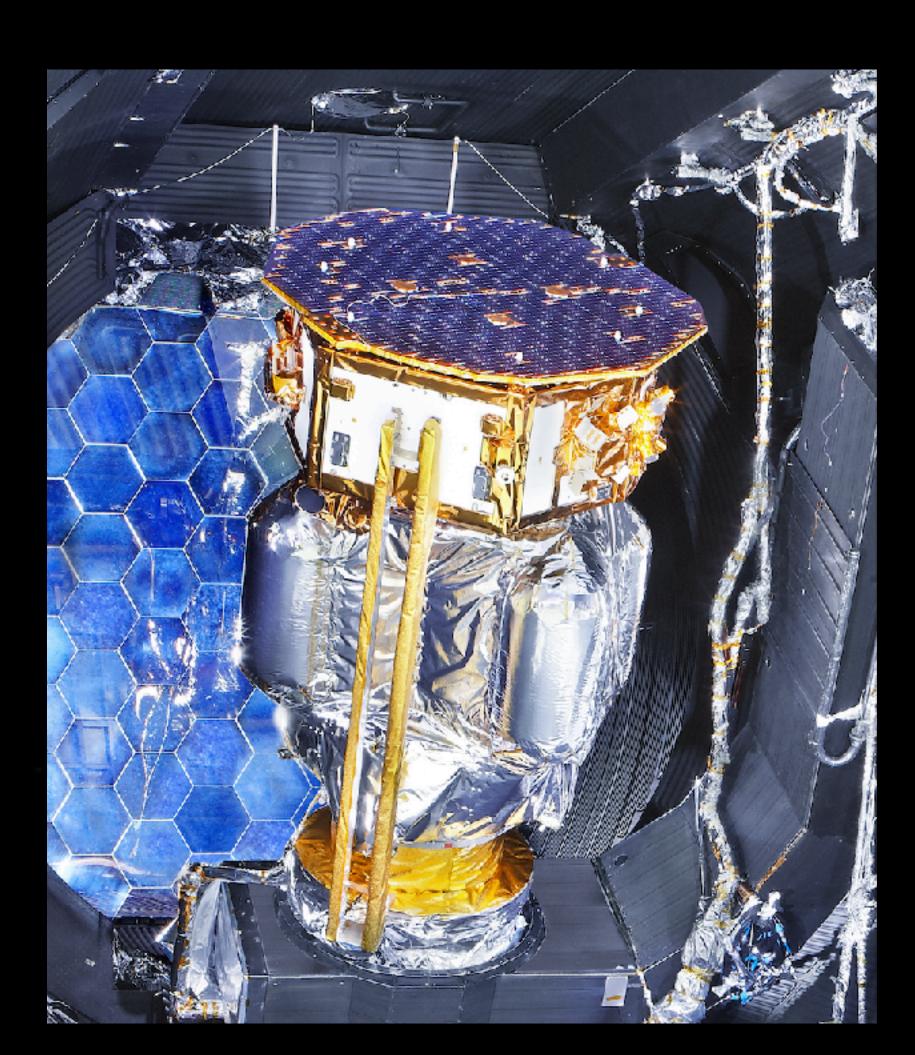
Merging white dwarfs in our Galaxy

## LISA Mission Concept



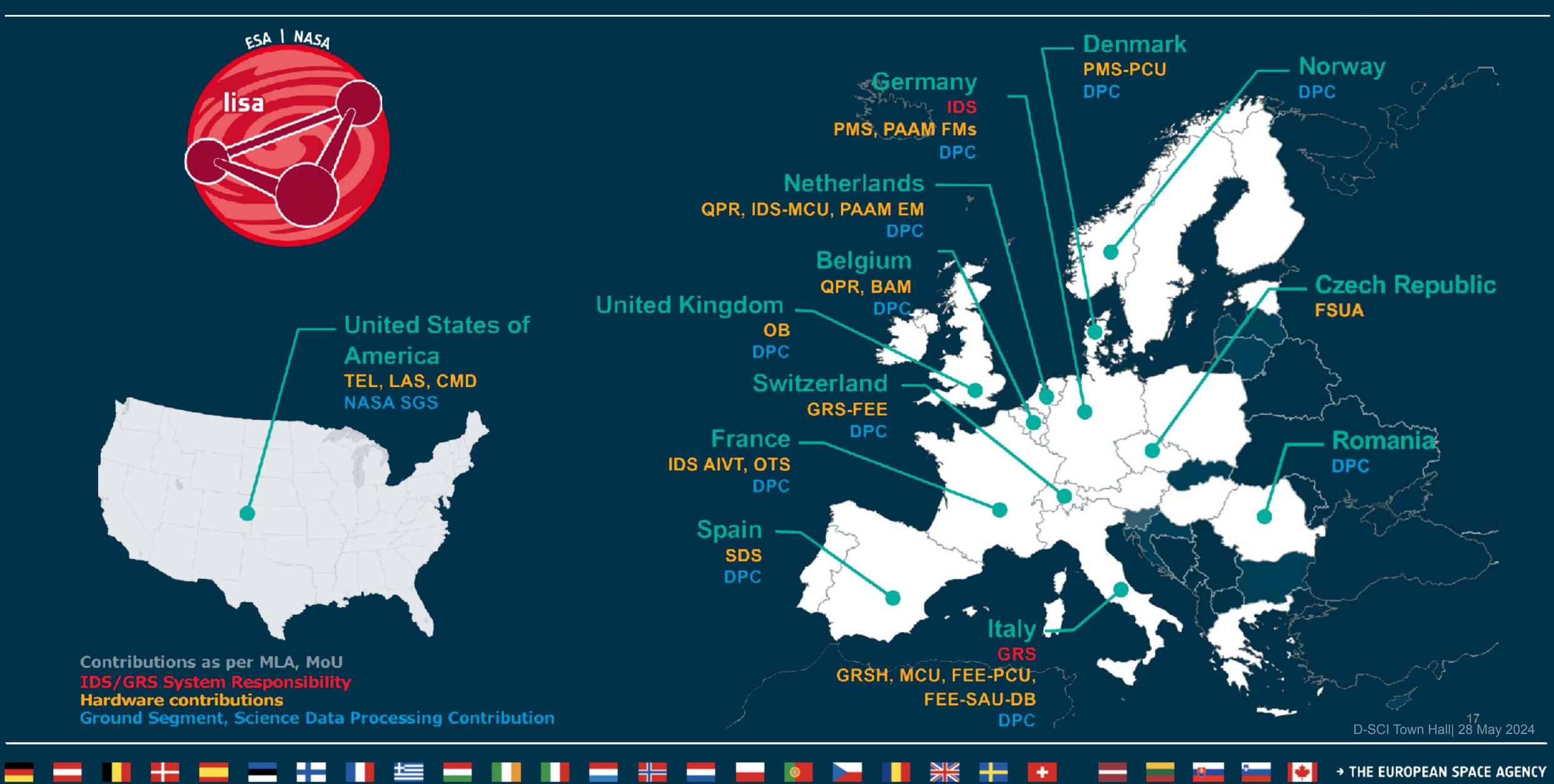
- Cluster of 3 spacecraft in heliocentric orbit
  - Allowing measurement of amplitude, polarisation of a gravitational waves, and the direction to the source
- Trailing Earth by ~20° (50million km)
  - Reduces gravitational effects of the Earth-Moon system
- Equilateral triangle constellation with 2.5million km arm length
  - Results on measurable pathlength changes due to passage of a GW
- Constellation inclined with respect to the ecliptic plane by 60°
  - Required by orbital mechanics
- Challenging technologies were flight tested on LISA Pathfinder





### LISA - An international mission led by ESA

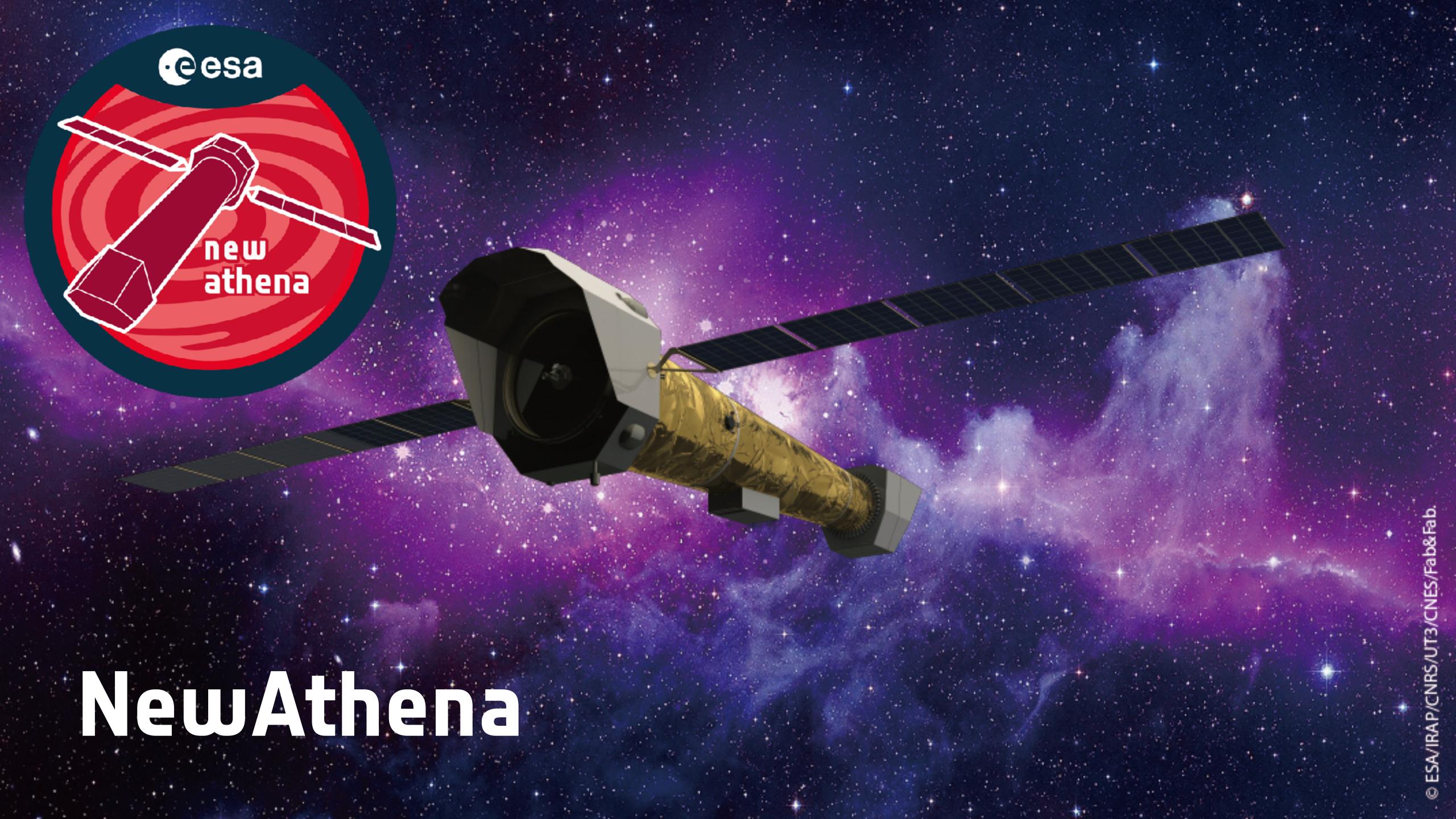




## LISA - Timeline



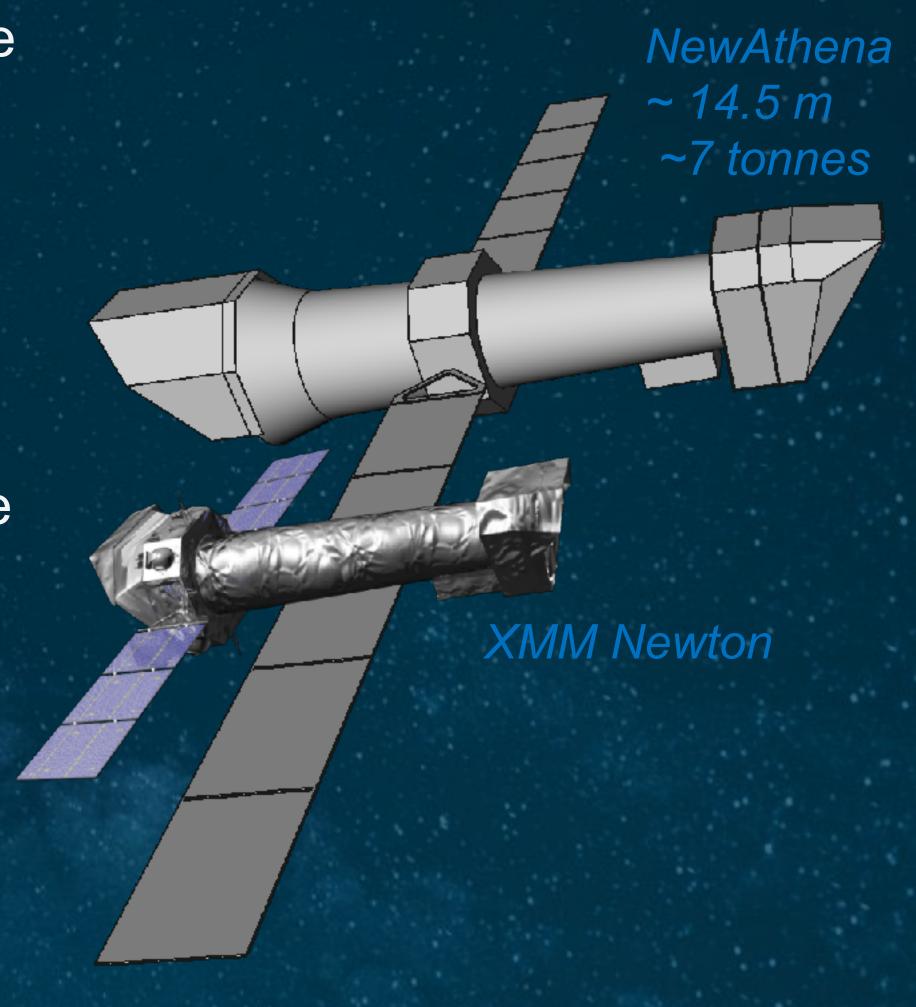




#### NewAthena



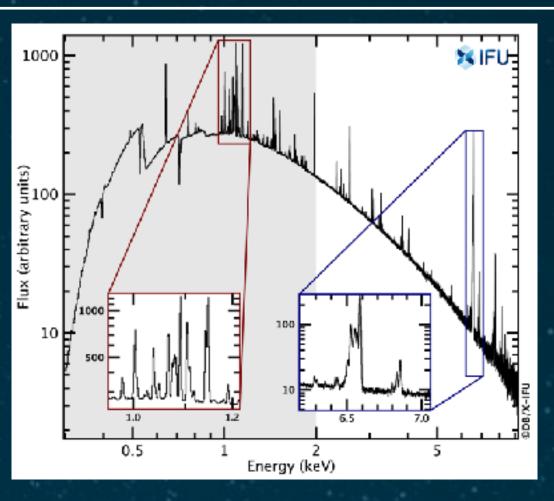
- The "Hot and Energetic Universe" was selected as the Science Theme for the 2nd Large Class launch-opportunity of Cosmic Vision
  - Athena was the mission selected to deliver this Science Theme
- The complexity of the mission led to cost increase and schedule slippage which could not be accommodated in the Science Programme
  - This led to a mission re-formulation in 2022
- After a herculean effort by the science community, the ESA study team, and the instrument teams, the re-formulated mission, NewAthena, is now back in Phase A



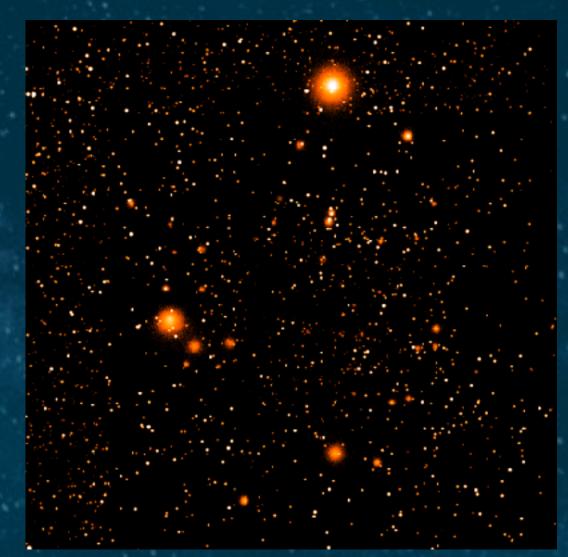
#### NewAthena - science



- NewAthena is a powerful, general-purpose open observatory
- Its scientific payload will allow unprecedented studies of a wide range of astronomical phenomena, including:
  - distant gamma-ray bursts
  - the hot gas found in the space around clusters of galaxies
  - accreting compact objects such as black holes over their whole mass range
  - Jupiter's auroras and comets in our own Solar System
- NewAthena will also provide a key contribution to multi-messenger astrophysics, in synergy with gravitational wave observatories and neutrino telescopes.



Simulated galaxy cluster X-ray emission seen by NewAthena spectrometer



Simulated deep field seen by NewAthena imager



#### Science Re-Definition Team



► NewAthena offers an unprecedented advance in X-ray sensitivity and spectral resolution over previous missions. It will address a range of seminal science questions in cosmology and astronomy and, being designed to lead developments in X-ray astrophysics in the next few decades, it will support the wide astronomical community with the opportunity to study astrophysical processes only accessible to X-ray instruments.

▶ In both the quantity of science outcomes and the uniqueness of observational data it will make available, NewAthena fully qualifies as an ESA Flagship mission.

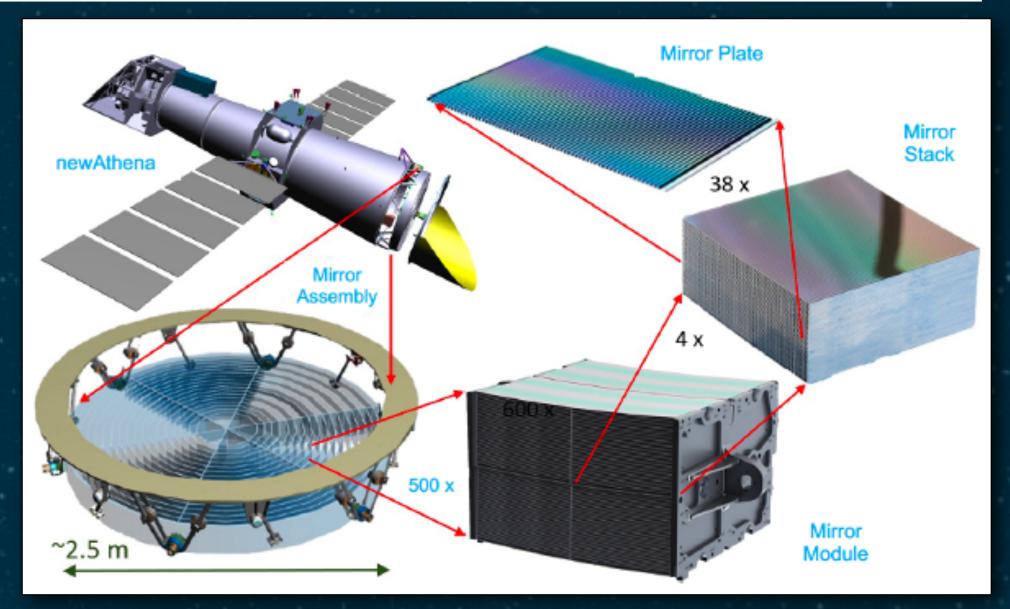
#### SRDT CONCLUSION

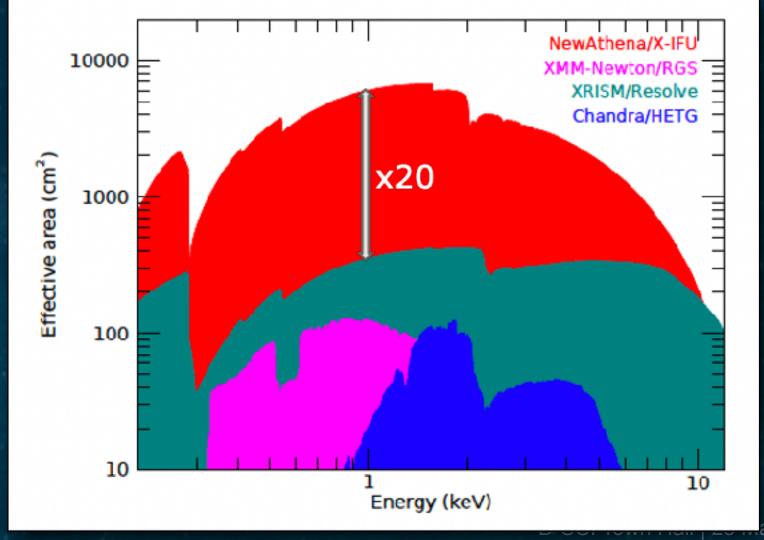




- NewAthena will carry the largest X-ray mirror ever conceived
  - Effective area at 1keV about one order of magnitude larger than any other mission
  - Telescope is based on Silicon Pore Optics, developed in the Netherlands
    - 125,000 Silicon plates (incl spares) → 2000 stacks of 38 plates → 500 mirror modules

- Require dedicated facilities to align and calibrate the mirror modules
  - Now being built by ESA in European Member States

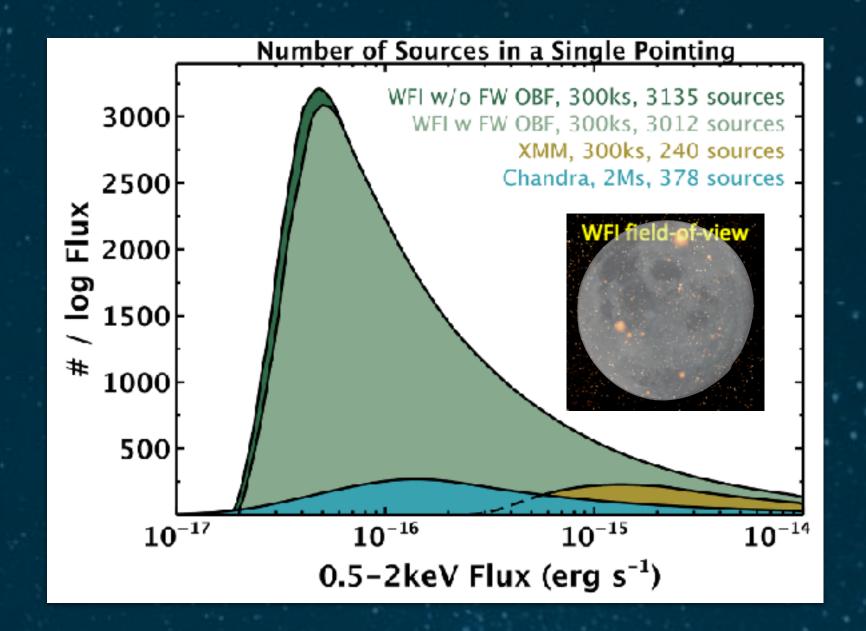


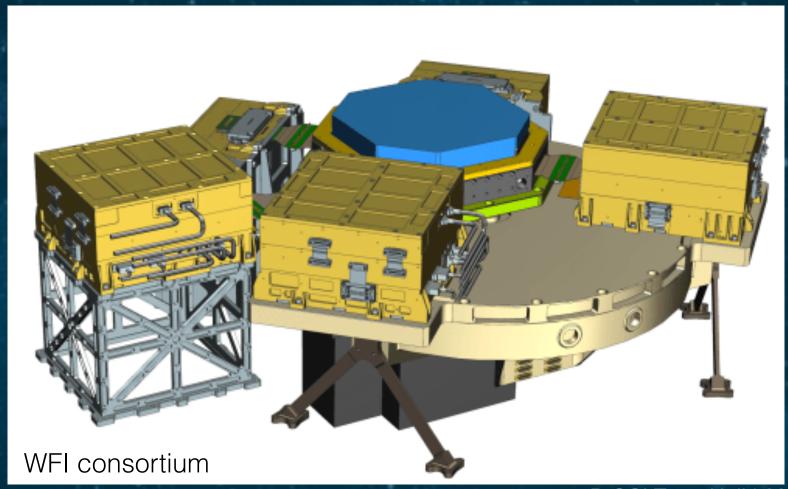




- NewAthena will carry the largest X-ray mirror ever conceived
- The NewAthena Wide Field Imager (WFI) is the fastest "X-ray survey machine" ever conceived

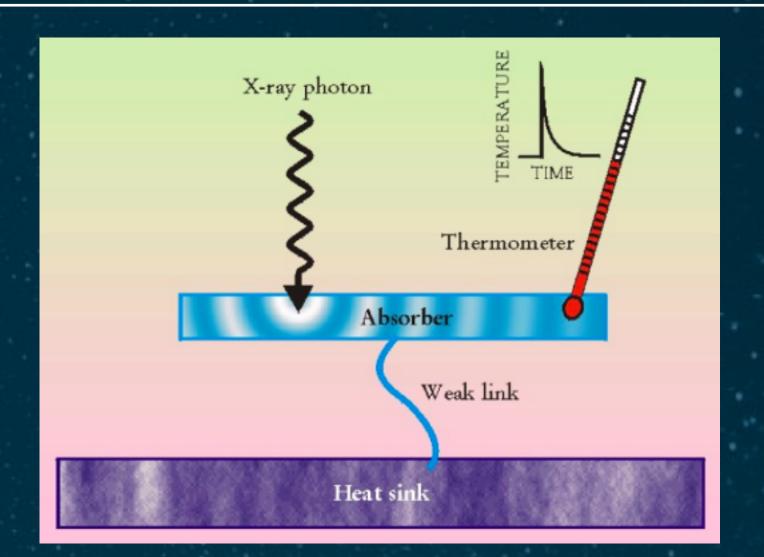
 Each pointing will detect 10 times more sources than a similar pointings by XMM-Newton or Chandra







- NewAthena will carry the largest X-ray mirror ever conceived
- The NewAthena Wide Field Imager (WFI) is the fastest "X-ray survey machine" ever conceived
- The X-ray Integrated Field Unit (X-IFU) is the *most accurate micro-calorimeter ever* 
  - Measure very small changes in the temperature of an absorber due to an incoming X-ray photon
  - Better energy resolution at E >2keV than any X-ray spectrometers conceived so far



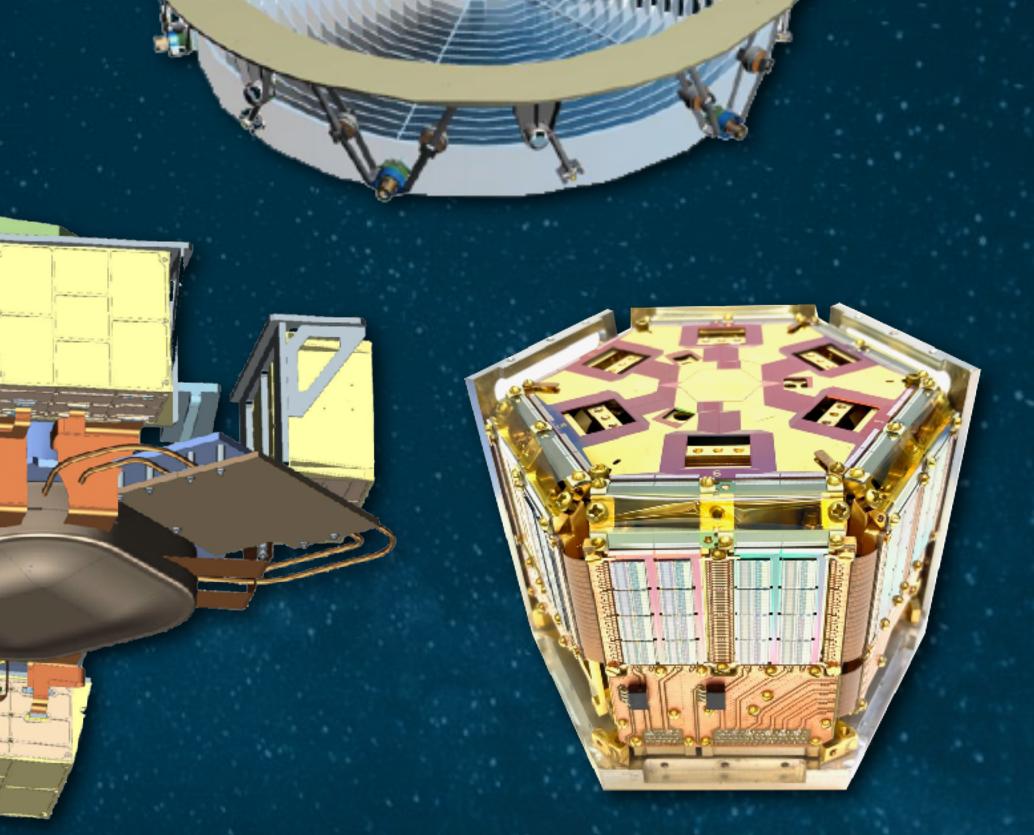




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# NewAthena timeline and development schedule



	Activity	Date
	Redefinition Study industrial kick-off	Q2 2024
	Redefinition Study Interim Review	June 2025
1	Instrument SRR	June 2026
	Mission Adoption Review	Q4 2026
	SPC Adoption	Q1 2027
	Phase B2/C/D/E1 industrial kick-off	Q1 2028
	SC PDR	~ 2029
	SC CDR	~ 2031
	Instrument FM deliveries	~ 2034
	Launch	2037

#### Conclusions



- The Cosmic Vision Programme of missions ends with LISA and NewAthena
- LISA was adopted by the Science Programme Committee in January 2024
  - Launch is scheduled for 2035
- NewAthena is heading towards adoption in 2027
  - Launch is scheduled for 2037
- ESA is continuing to invest significantly in the instrument and spacecraft technology to ensure a timely adoption of NewAthena
  - A detailed work plan has been established to secure the study and implementation schedule

