

Athena Update



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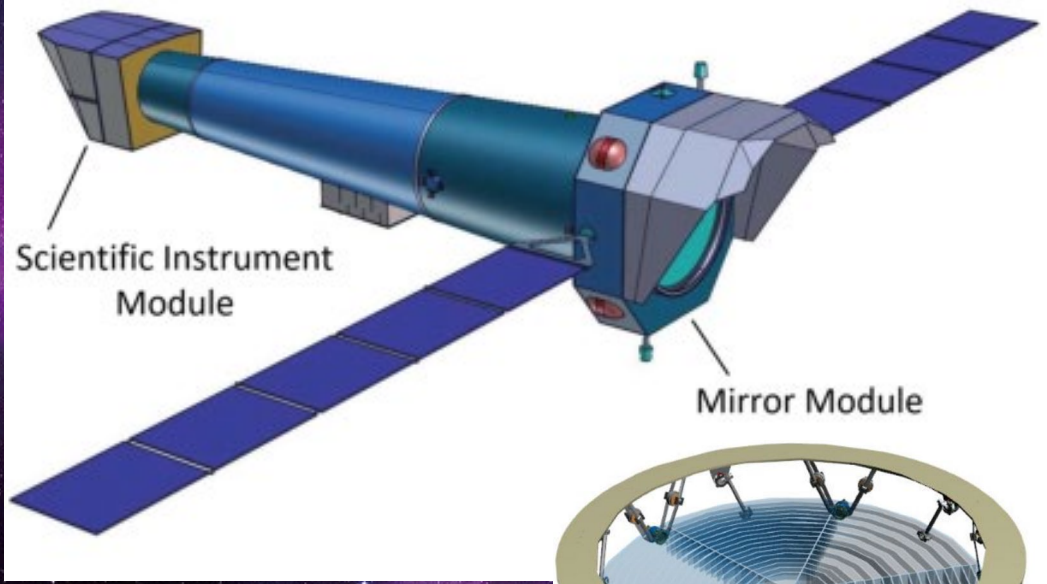


A flagship mission for flagship level science.

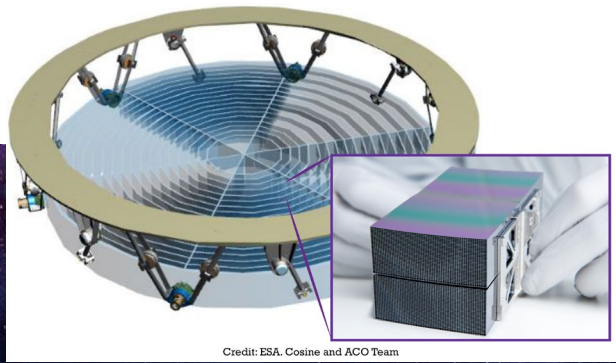
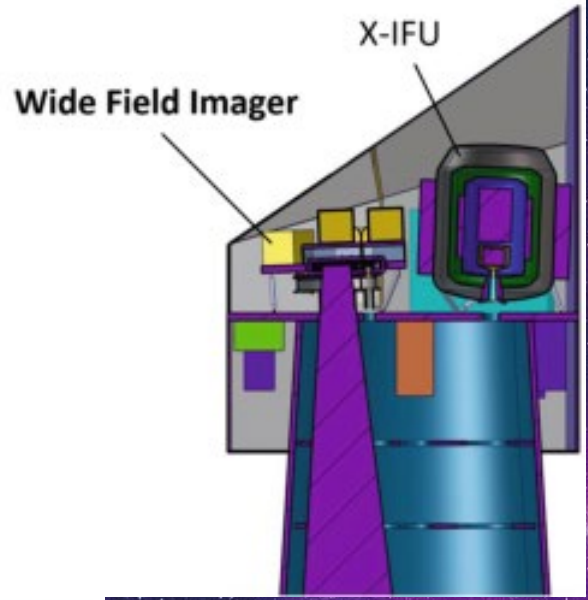
Selected in 2014 by ESA as the L-class mission of the Cosmic Vision program.

- Ascertain the nature of the primary source of high-energy radiation in stellar-mass and supermassive accreting black holes (Active Galactic Nuclei, AGN), and its connection with accretion and ejection mechanisms close to the event horizon.
- Determine the mechanism(s) regulating the cosmological co-evolution of accreting black holes and their host galaxies.
- Measure the space density of the AGN that dominate the supermassive black hole growth, reaching combinations of luminosity and obscuration hitherto unexplored.
- Constrain the kinematics of hot gas and metals in massive halos (galaxy clusters and groups).
- Map the properties of the most common baryonic reservoirs in the Universe and probe their evolution and connection to the cosmic web.
- Constrain supernova explosion mechanisms by determining the 3-dimensional kinematics, ionization state and abundances in young remnants probing the physics of the enrichment and heating of our Galaxy's interstellar medium.
- Provide novel and unprecedented constraints on the equation of the state of neutron stars exploring the behavior of matter under extreme conditions of density and magnetic fields.
- Study star-planet interactions through the stellar magnetic activity in exoplanet-hosting systems.

ATHENA Spacecraft



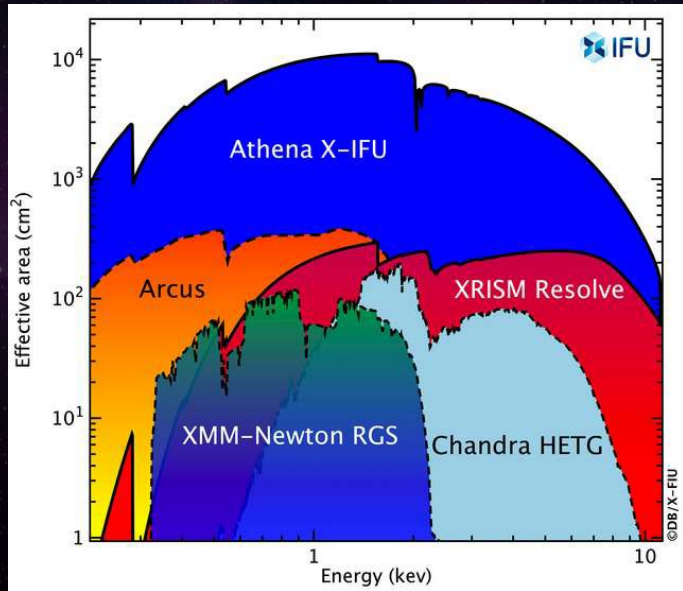
Scientific Instrument Module



Credit: ESA, Cosine and ACO Team

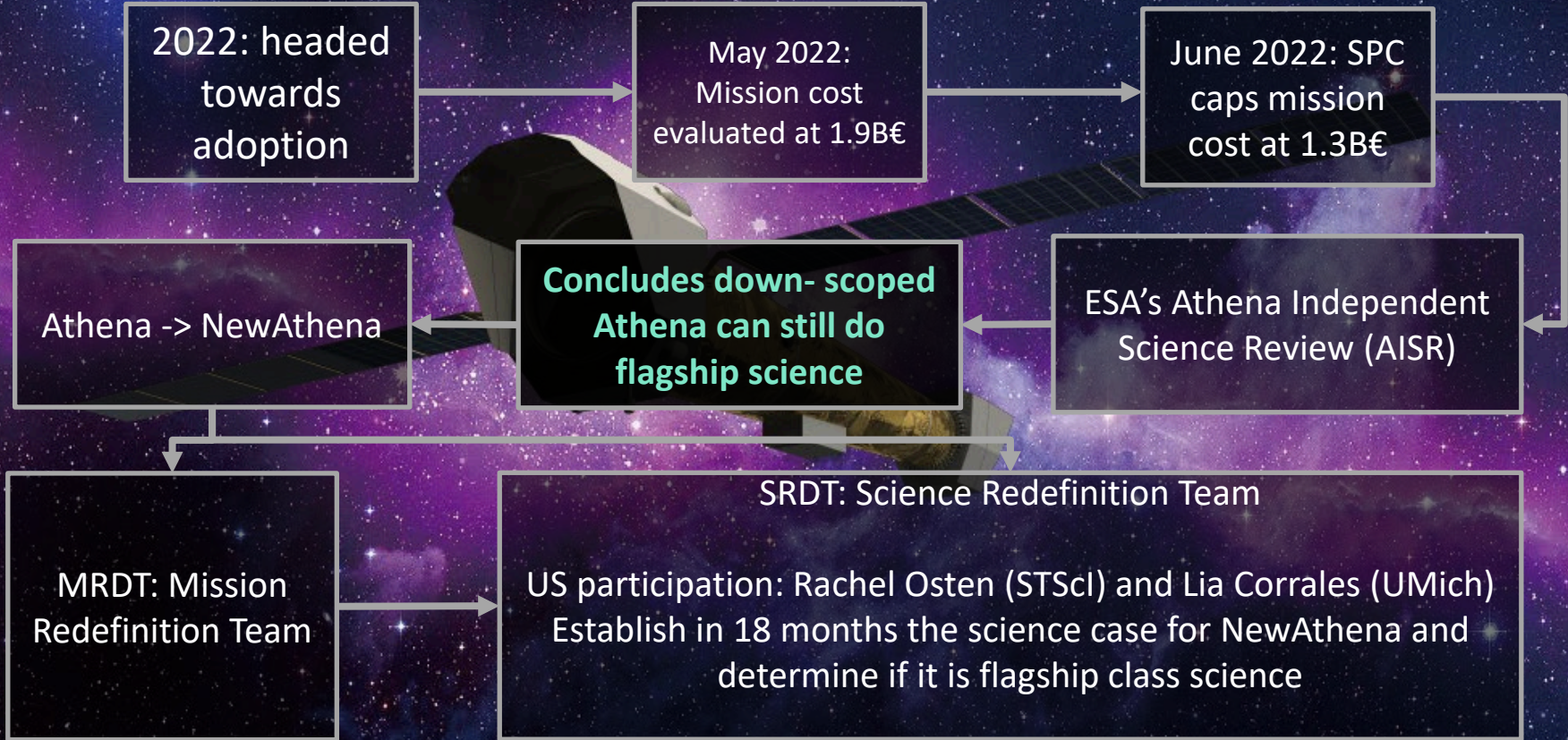


What do we get with Athena?





Previously on Athena ...





- November 2023 the SRDT finishes their evaluation and present to the SPC.
- November 8th, the ESA Science Program Committee (SPC) endorses NewAthena:

New way forward for future large (L-class) mission: NewAthena

ESA's Science Programme Committee has also today endorsed a rescope version of Athena, which was selected as a large mission in 2014. Designed to capture X-ray light to study the hot and energetic Universe, the way forward for 'NewAthena' is expected to transform our knowledge in almost every corner of modern astrophysics.

ESA, the science community, instrument teams, and international partners have worked hard to come up with a simplified mission design that meets the cost requirements set by the Science Programme Committee but nevertheless delivers scientific excellence and ambition in line with that expected of a flagship L-class mission.



- The SRDT will release a report at the end of January 2024, detailing the science requirements, science program, and the instrument performance
- The SRDT will be disbanded at the end of January 2024
- Call for new ASST (Athena Science Study Team) early 2024
 - include 8 members by ESA
 - additional de-facto members by partners
 - one for each instrument consortium
- ASST will write the new science requirements document. Complete this activity by the end of 2024.



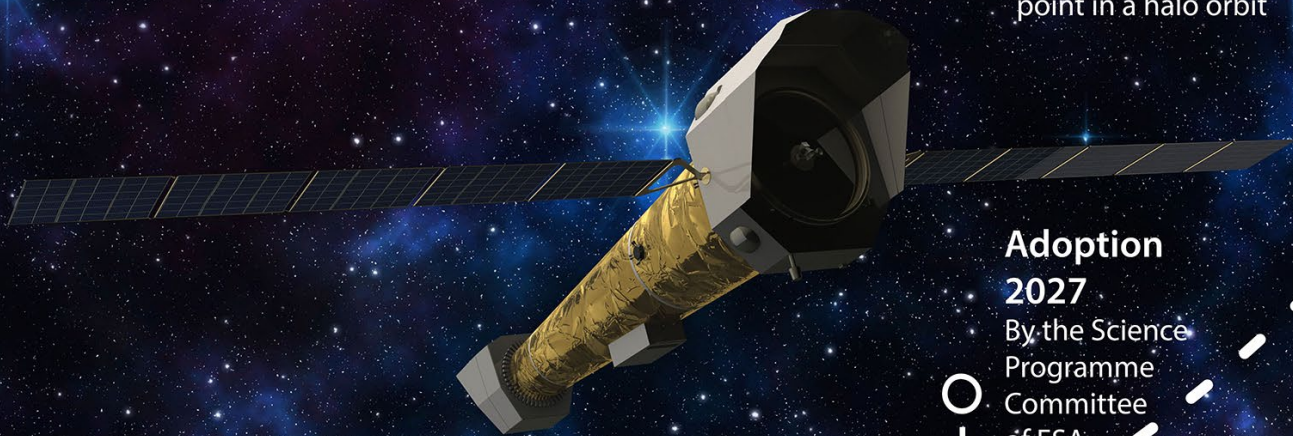
Main:

- X-IFU sensor and read-out
- 5K Cryocooler for the X-IFU
- Vibration Isolation System (VIS) – “SoftRide” reduces launch loads on the Science Instrument Module

Additional:

- NASA Athena Data Center contribution to Science Ground Segment (SGS)
- Consultation for the WFI ASIC
- WFI Background Analysis Modeling (BAM)

Charting a course forward



Planned Launch

2037

By an Ariane 6.4 vehicle to the first Sun-Earth Lagrangian point in a halo orbit

Adoption

2027

By the Science Programme Committee of ESA

Phase A

2024

Restarting industrial activities

Selection

2014

Hot and Energetic Universe proposal

Happy New Year 2024!



NewAthena Science Requirements (TBD)



Parameter (<i>worse than Athena</i>)	Athena requirement	Best performance	Worst performance
X-IFU total effective area at 7keV	0.16 m ²	0.10 m ²	0.09 m ²
X-IFU total effective area at 1 keV	1.05 m ²	0.85 m ²	0.52 m ²
X-IFU Energy resolution at 7keV	2.5 eV	3 eV	4 eV
X-IFU Field of View (effective diameter)	5 arc mins	5 arc mins	4 arc mins
X-IFU Pixel Size	5 arc secs	5 arc secs	5 arc secs
X-IFU Background (2-7 keV)	5x10 ⁻³ ph cm ⁻² s ⁻¹ keV ⁻¹	5x10 ⁻³ ph cm ⁻² s ⁻¹ keV ⁻¹	5x10 ⁻³ ph cm ⁻² s ⁻¹ keV ⁻¹
WFI Effective area at 1 keV	1.25 m ²	1.14 m ²	0.86 m ²
WFI Field of view (side)	40x40 arc mins	40x40 arc mins	30x30 arc mins
WFI Background (2-10 keV)	5x10 ⁻³ ph cm ⁻² s ⁻¹ keV ⁻¹	5x10 ⁻³ ph cm ⁻² s ⁻¹ keV ⁻¹	7x10 ⁻³ ph cm ⁻² s ⁻¹ keV ⁻¹
Background knowledge	2%	2%	5%
Optics angular resolution on-axis @ 1 keV	5 arc secs	5 arc secs	9 arc secs
Field-of-view averaged optics angular resolution @1 keV	N/A	on-axis + 1 arc secs	on-axis + 1 arc secs
Point source (45 off-axis) X-ray stray light area ratio against on-axis area	1x10 ⁻³	1x10 ⁻³	1x10 ⁻³
Field of regard	50%	40%	34%
ToO Response time	4 hours	4 hours	12 hours

“Athena requirement” = Athena requirements going into adoption review in 2022

Best/worst performance = range adopted by SRDT