NewAthena status report

Didier Barret (IRAP, Toulouse, France)
X-IFU Principal Investigator

ATPEM days, October 1st to 3rd, 2025

Where do we stand ?

Preparing the adoption of the mission in 2027

- Adoption of the mission means that it gets graved in the ESA science program and that the big industrial contracts can be issued to build the mission — To get newAthena adopted is our top priority goal

- After successfully passing an interim/intermediate review (mid-2025), activities are now aiming at consolidating the mission baseline, keeping an eye on the « costs » and maturing our technologies

- Consolidating programmatically the mission has triggered much attention lately, as a result of possible budget cuts at NASA science — we do have a credible plan for newAthena !

- The newAthena community has been restructured and is now actively involved in the preparation of science and methodology papers for an A&A special issue to support the adoption process of newAthena
  - Overwhelming response with over ~200 abstracts received from the 7 working groups !
    - ➡ We still have a very active community behind the mission !

How is the newAthena science doing ?

Builds upon the Athena science case with a different spin

Mission Driving Science Objective	Science goals	Methods
X-ray Sources in AGN & Compact Objects	Locate and characterize the primary X-ray source	Time-resolved spectroscopy & reverberation mapping
AGN Outflows & Galaxy Evolution	Understand AGN-driven winds and their impact since Cosmic Noon	WFI surveys + X-IFU follow-up of warm absorbers & UFOs
Early Black Hole Growth	Measure the space density of AGN at z ≳ 6–8	Deep & wide WFI surveys to detect high-z, obscured AGN
Hot Gas in Galaxy Clusters	Constrain kinematics of intracluster hot gas & metals	X-IFU mapping of turbulence & bulk motions
Cosmic Baryon Reservoirs	Map CGM & WHIM as main baryonic reservoirs	WFI wide surveys & stacked galaxy analysis
Deep Spectroscopy of the Cosmic Web	Characterize CGM/IGM in emission & WHIM in absorption	X-IFU deep observations against AGN/blazars
Chemical Enrichment Over Time	Trace element abundances across cosmic epochs	WFI & X-IFU studies of Fe and rare elements in ICM
Multi-Messenger Astrophysics	X-ray census of GW event counterparts	Detect GRB/afterglows to probe jets, engines, cosmology
Neutron Star Physics	Constrain the neutron star equation of state	Pulse profile modeling + X-ray/radio timing for NS radii

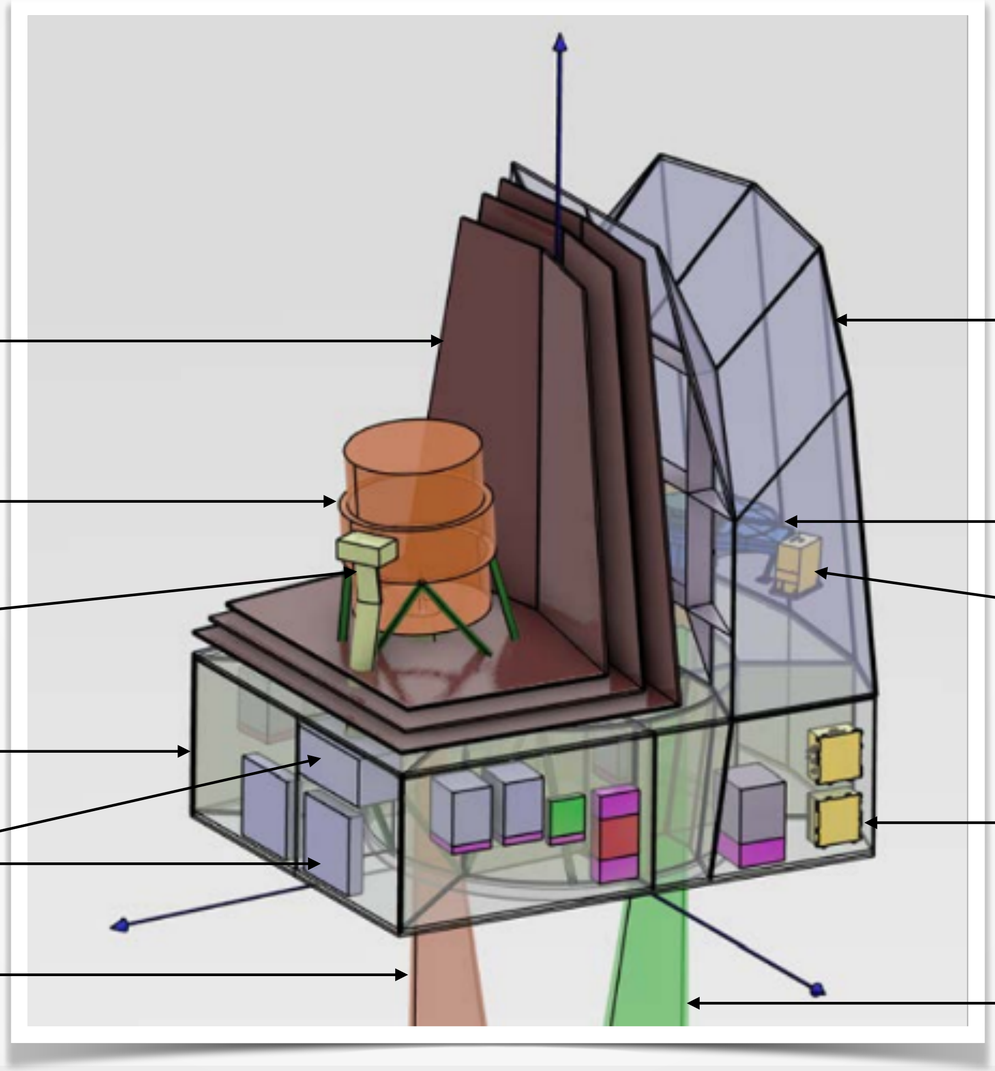
How is the mission doing ?

A simplified design after reformulation

- The mission was reformulated from mid-2022 to November 2023 as to simplify its concept and bring the cost within an enveloppe affordable by the ESA science program
- A key element in the success of the reformulation was the re-affirmed support of the French Space Agency in leading the procurement of X-IFU on behalf of the X-IFU Consortium
- Main impact of the reformulation was on X-IFU which now relies on passive cooling
  - X-IFU performance requirements were also relaxed as to reduce constraints on the system accommodating XIFU : most notably the spectral resolution (4 eV) and the field of view (4’)
    - ➡ We are still designing a flagship mission !
  - Transfer of some responsibilities from ESA to the X-IFU Consortium/NASA, e.g. the Dewar, cooler
    - ➡ No show stopper identified so far — to the contrary, evidence that the new design eases the instrument integration (X-IFU Dewar & filters)

How about the newAthena payload?

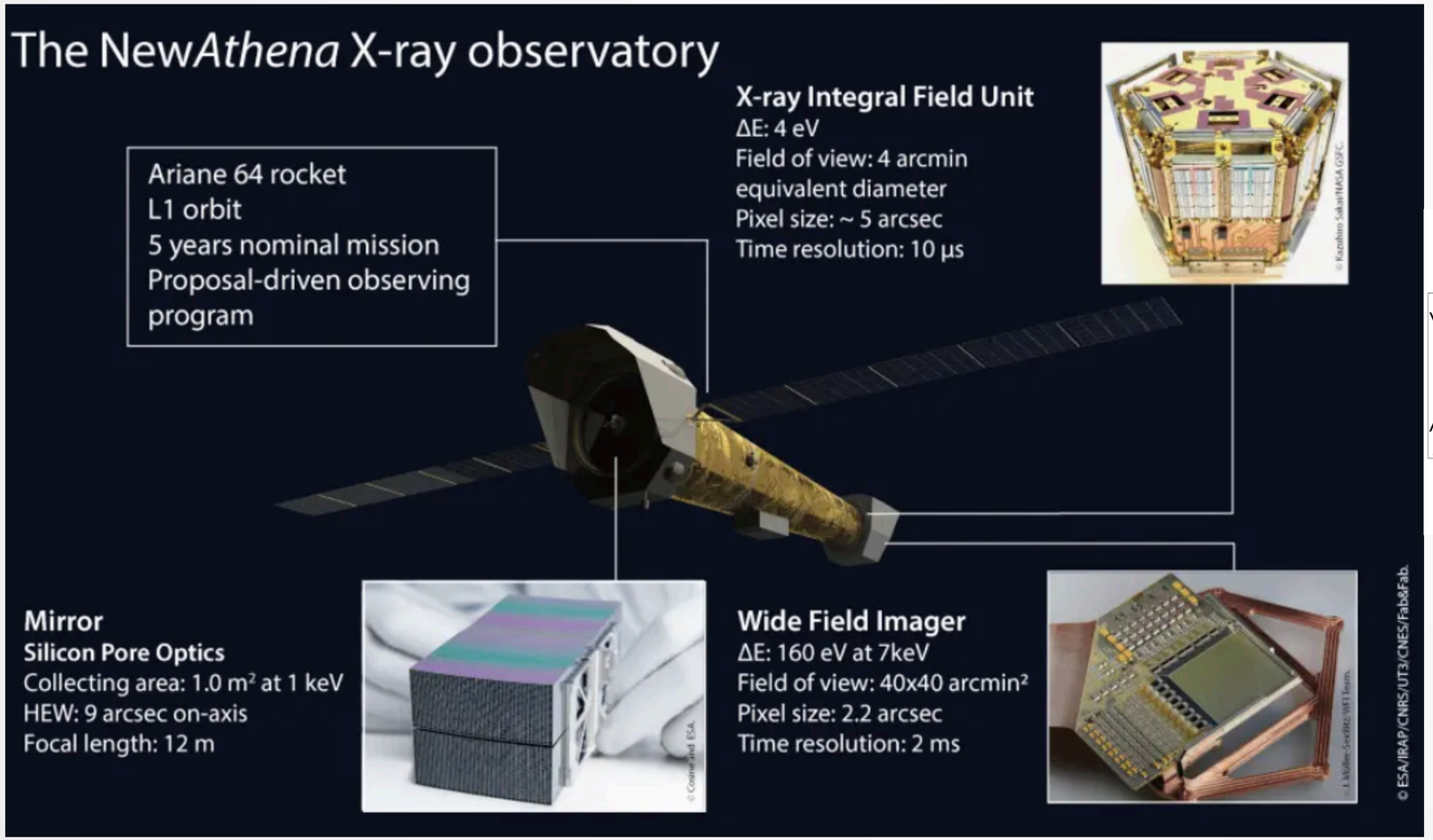
Introducing passive cooling



Courtesy ESA

What are the key numbers for newAthena?

Still breakthrough performances



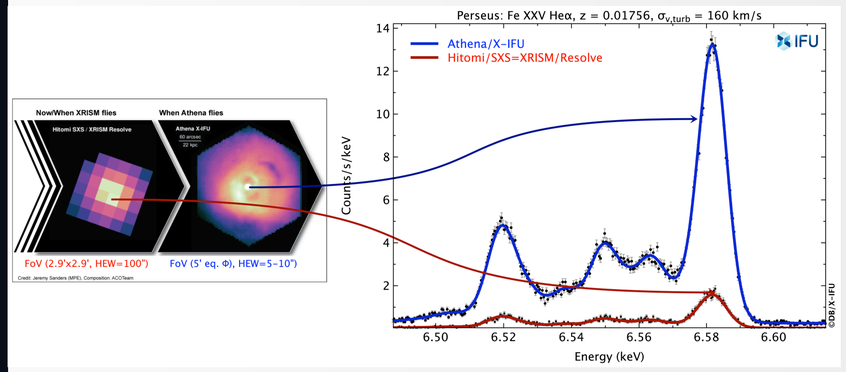
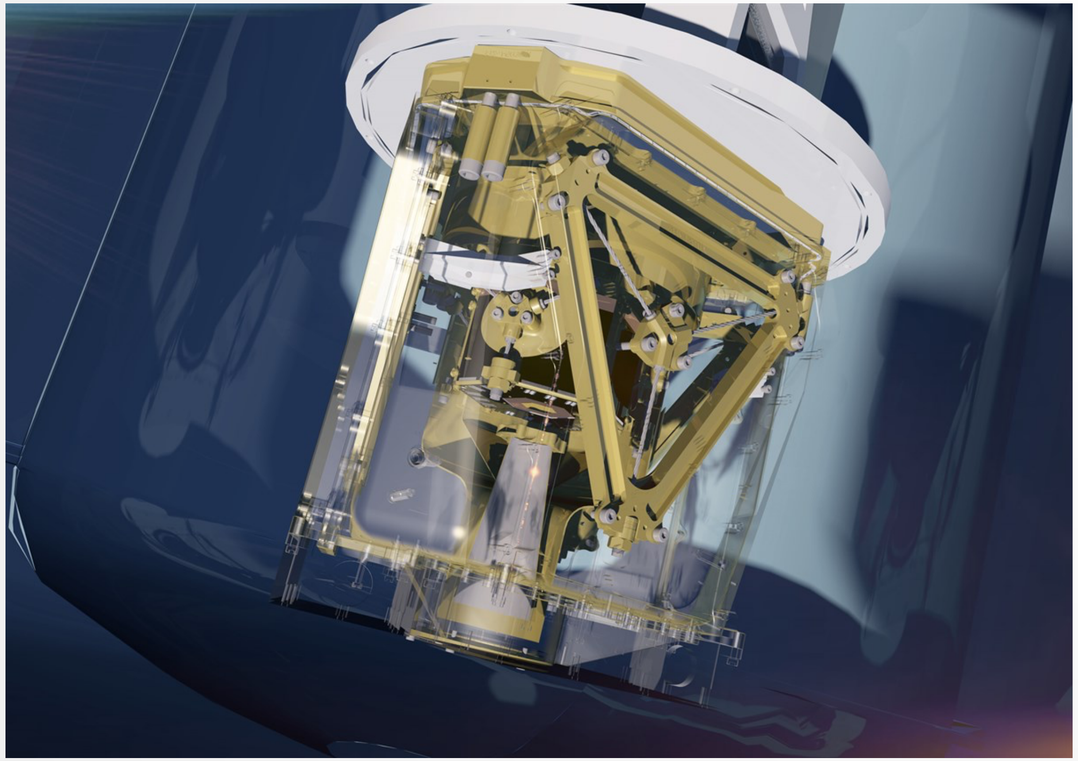


Illustration of the gain in spatial resolution (left) and sensitivity (counts/bin, right) between XRISM/Resolve and Athena/X-IFU (@J. Sanders, ACO, X-IFU D. Barret)

How is the technology doing ?

Ramping up technology demonstration activities

- X-IFU has key technologies that are the prime focus of early developments (TES array, Focal Plane Assembly, cold electronics, readout electronics, filters….)



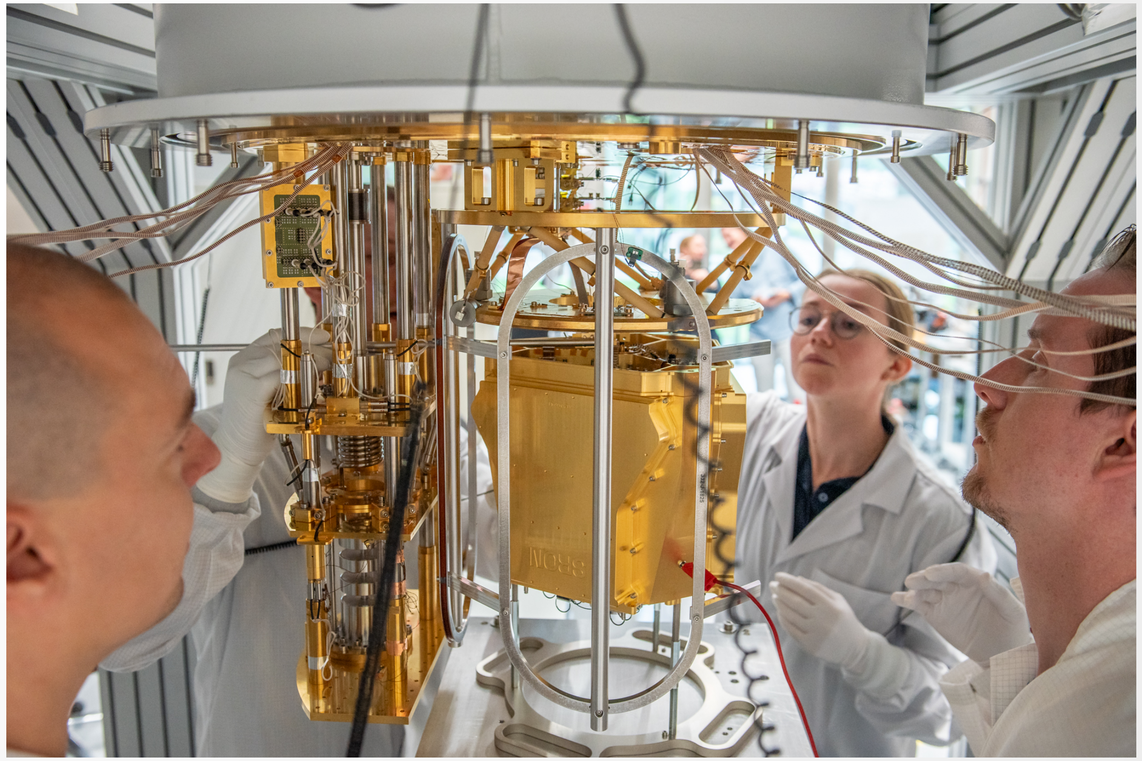


Image credit: SRON / Claudia van Oostrum.

Is the NASA situation critical ?

Under control

- NASA is a junior partner to newAthena (overall contribution ~150 M$ less than 10% of the total budget)
- Our baseline remains NASA confirming its contribution to the mission:
  - Recent developments makes that plausible : funding restored for science compared to the original presidential budget request
- Yet we must consider backups, in case NASA pulls out (not our baseline):
  - For newAthena, we do have European credible backups for the X-IFU TES detectors (SRON) and for the 4K Cooler (European industry activated, building on the Planck legacy)
  - The option to purchase critical equipments in the US exists also, e.g. the front-end SQUIDs from NIST.
    - ➡ Associated delay to be carefully evaluated but should remain within at most a couple of years
  - All options considered make newAthena feasible without participation from NASA !

How is the community organized ?

Restructuration matches the science goals of the mission

NewAthena Science Study Team (NASST)

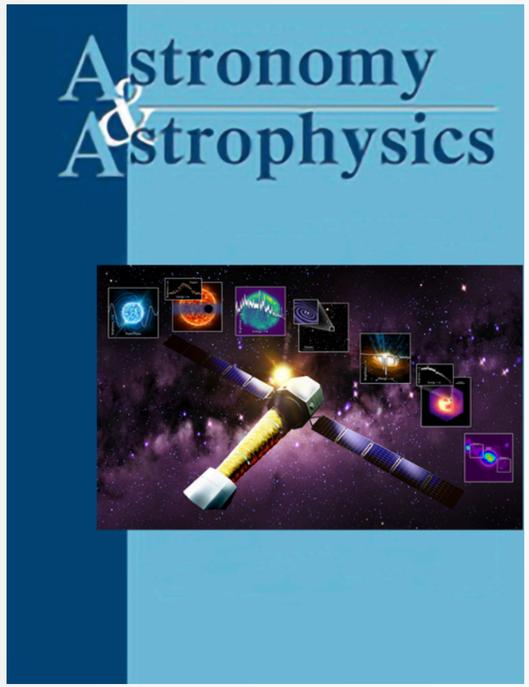
Dr Matteo Guainazzi - ESA project scientist - ESTEC/ESA, **Prof Didier Barret** - X-IFU PI - Institut de Recherche en Astrophysique et Planétologie, **Prof Kirpal Nandra** - WFI PI - Max-Planck-Institute für extraterrestrische Physik, **Dr James Aird** - University of Edinburgh, **Dr Laura Brenneman** - NASA representative - Harvard & Smithsonian Center for Astrophysics, **Dr Elisa Costantini** - SRON Netherlands Institute for Space Research, **Dr Thomas Dauser** - Dr. Karl Remeis-Sternwarte. Universität Erlangen-Nürnberg, **Dr Dominique Eckert** - Université de Genève, **Dr Hirofumi Noda** - JAXA representative - Astronomical Institute. Tohoku University, **Dr Ciro Pinto** - Istituto di Astrofisica Spaziale e Fisica Cosmica Palermo (INAF – IASF), **Dr Gabriel Pratt** - CEA Saclay - IRFU - Département d'Astrophysique, **Prof Nanda Rea** - Institut de Ciencies de l'Espai (ICE-CSIC), **Dr Eleonora Troja** - Università degli Studi di Roma Tor Vergata.

- 7 Science Working Groups in support of the NASST in theory, simulations, synthetic observations, data analysis, systematic uncertainties (atomic pyhsics …)
- Regular calls to join the newAthena community and its working groups — Don't miss the call if you are interested

SWG1	SWG2	SWG3	SWG4
Large-scale structure of the Universe Chair: Aurora Simionescu	**Galaxies and supermassive black holes** Chair: Javier García	**Stars and their environment** Chair: Marco Miceli	**Compact objects** Chair: Matthew Middleton
NASST liaisons Ciro Pinto / Gabriel Pratt	**NASST liaisons** James Aird / Laura Brenneman / Hirofumi Noda	**NASST liaisons** Elisa Costantini	**NASST liaisons** Thomas Dauser / Nanda Rea
Co-chairs: Mariachiara Rossetti / François Mernier	**Co-chairs:** Fancisco J. Carrera / Giovanni Miniutti	**Co-chairs:** Costanza Argiroffi / Manami Sasaki	**Co-chairs:** Enrico Bozzo / Sebastien Guillot
SWG5	SWG6	SWG7	
Transients and multi-messenger astrophysics Chair: Carlo Ferrigno	**Cosmology and fundamental physics** Chair: Esra Bulbul	**Science Support** Chair: Fabio Acero	
NASST liaisons Eleonora Troja	**NASST liaisons** Dominique Eckert	**NASST liaisons** Matteo Guainazzi	
Co-chairs: Tingting Liu / Shuo Zhang	**Co-chairs:** Julia Sisk Reynes / Florian Pacaud	**Co-chairs:** Iacopo Bartalucci / Liyi Gu	

Is the community still active?

Massive engagement in the call for A&A special issue papers



- 195 abstracts receiving showcasing the seminal impact that NewAthena is expected to have on many fields of modern astronomy —> target 60 papers of 6 pages !

- Papers shall be prepared in the first half of 2026
- NASST will organize a lean internal review process before the formal submission to the journal (Q3/2026)
- Target for publication is early 2027 with material severing as inputs for the so called red book required for the adoption of the mission
- Contact me directly if you want to join the effort (but you missed the train) !

How should I conclude?

We are on track !

- Adoption of the mission is our next milestone : Expected in 2027 and we will be there !
- The mission design gets consolidated with no show-stopper identified thus far, to preserve its flagship character
  - Technology demonstration activities delivering outstanding results on key subsystems
- Programmatic consolidation of the mission is under way but we have a credible plan in all cases
- Our community is active and engaged and deserves this mission more than anything else
  - Get used to X-IFU-like data with XRISM-Resolve data: excellent prospective for atomic physics, new tools, new models…