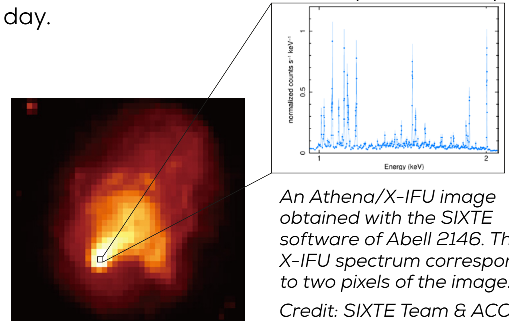
SCIENCE THEME

THE HOT AND ENERGETIC UNIVERSE

The *Athena* observatory will pursue three main scientific objectives:

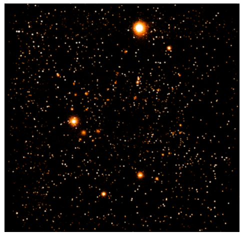
1. Determine how and when large-scale hot gas structures formed in the Universe and track their evolution from the formation epoch to the present day.



An Athena/X-IFU image obtained with the SIXTE software of Abell 2146. The X-IFU spectrum corresponds to two pixels of the image.

Credit: SIXTE Team & ACO.

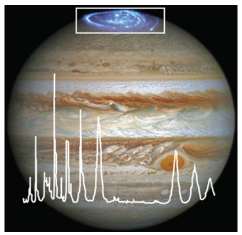
2. Perform a complete census of black hole growth in the Universe, determine the physical processes responsible for that growth and its influence on larger scales, and trace these and other energetic and transient phenomena to the earliest cosmic epochs.



Deep Athena WFI images, such as this simulation, will reveal growing supermassive black holes out to the edge of the observable Universe.

Credit: WFI Team.

3. Provide a unique contribution to astrophysics in the 2030s by exploring high energy phenomena in all astrophysical contexts, including those yet to be discovered.



Jupiter's aurora (blue glow at the pole) imaged by Chandra and simulated Athena X-IFU spectrum (white line) superimposed on an optical image of the planet.

Credit: J. Nichols (Univ. of Leicester), NASA and ESA. Spectrum: G. Branduardi-Raymont (UCL).

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MISSION

OBSERVE X-RAYS FROM COSMIC SOURCES

Athena will be ESA's next large X-ray observatory offering breakthrough capabilities in spatially-resolved high-resolution spectroscopy and deep wide-field spectral imaging greatly exceeding current facilities.

- Due to launch in the early 2030s with an Ariane 64 rocket.
- Halo orbit at 1st Sun-Earth Lagrangian Point (L1).
- 4 year baseline mission plus possible extensions.
- Proposal-driven observing program.
- Two complementary state-of-the-art instruments.
- ≥ 1.4 m^2 collecting area at 1 keV.

ATHENA

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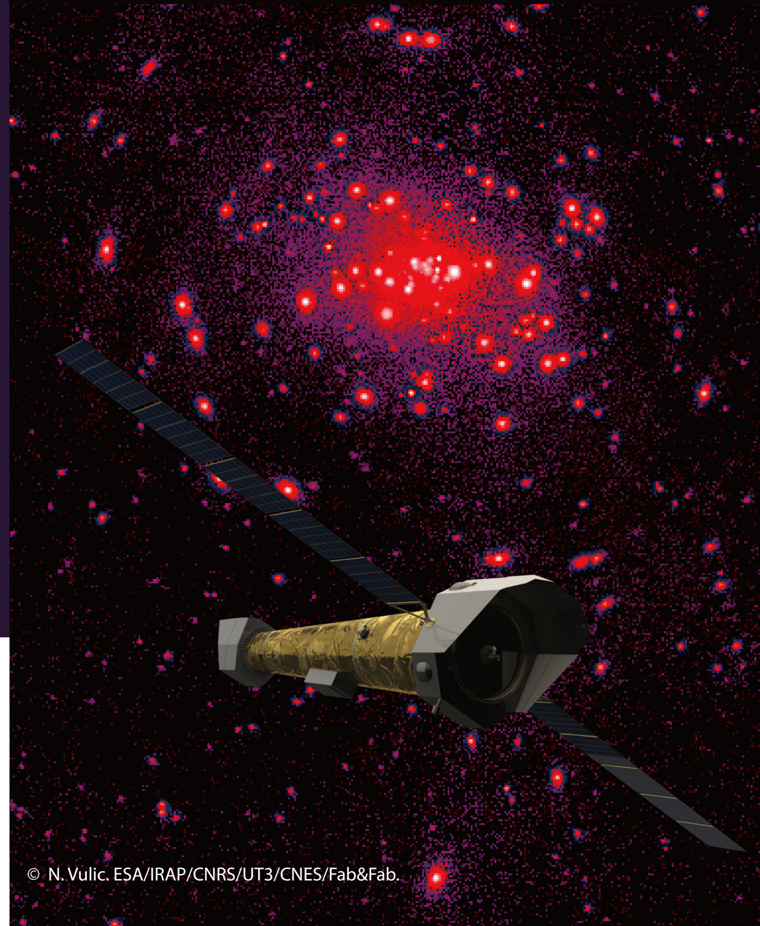
ATHENA

THE ADVANCED TELESCOPE FOR HIGH ENERGY ASTROPHYSICS

www.the-athena-x-ray-observatory.eu

Athena (Advanced Telescope for High ENergy Astrophysics) is ESA's next generation X-ray observatory to address the Hot and Energetic Universe. It is the second large-class mission in the Cosmic Vision programme.



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ATHENA

OBSERVATORY

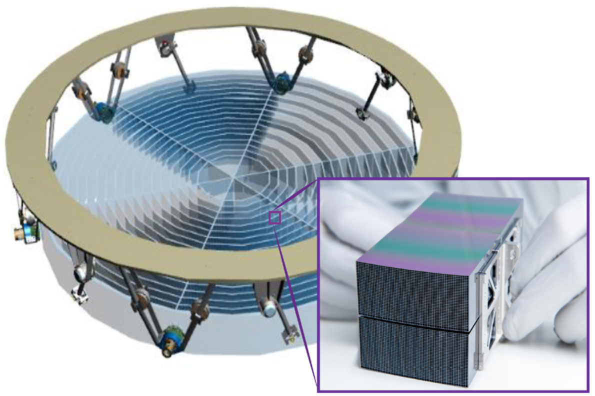
Single X-ray Large Area Telescope with two instruments
Wide-Field Imager and X-ray Integral Field Unit

MIRROR

Large-aperture grazing-incidence telescope, utilising a novel high-performance Silicon pore optics technology developed in Europe.

The 12 m focal length *Athena* mirror will deliver unprecedented effective area with excellent spatial resolution and a large field of view, all with very light weight. The telescope changes focus between two instruments.

Technology	*Silicon Pore Optics*
Effective area at 1 keV	*1.4 m²*
Effective area at 6 keV	*0.25 m²*
Spatial Resolution (Half Energy Width < 7keV)	*5 arcsec on axis, 10 arcsec off axis*



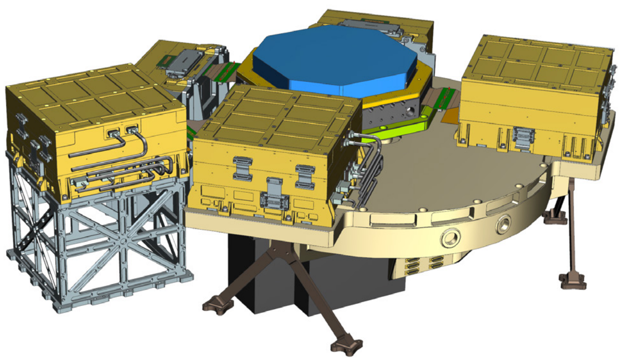
Credit: Cosine and ESA.

WIDE FIELD IMAGER (WFI)

Providing sensitive wide field imaging and spectroscopy, and high count-rate capability with a 40'x 40' field of view.

The WFI detector is based on Silicon DEPFET Active Pixel Sensor technology. The large field of view is achieved via a focal plane composed of several detectors: a larger detector array for wide-field observations and a smaller fast readout detector for very bright targets.

Technology	*DEPFET Active Pixel Sensor*
Spectral resolution	*< 170 eV at 7 KeV*
Field of View	*40 arcmin x 40 arcmin*
Pixel size	*2.2 arcsec*
Time resolution	*5 ms*



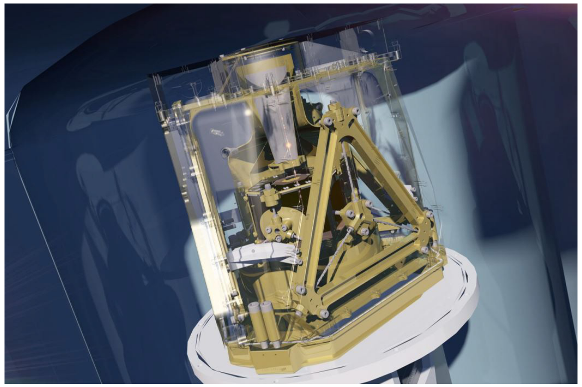
Credit: WFI Team.

X-RAY INTEGRAL FIELD UNIT (X-IFU)

Delivering spatially-resolved high-resolution X-ray spectroscopy over a field of view of 5' equivalent diameter.

The X-IFU is a cryogenic X-ray spectrometer, based on a large array of Transition Edge Sensors, providing both spatially-resolved high spectral resolution and high count rate capability with the optics defocussed.

Technology	*Transition Edge Sensor (TES)*
Spectral resolution	*2.5 eV*
Field of View	*5 arcmin diameter*
Pixel size	*< 5 arcsec*
Time resolution	*10 µs*



Credit: IRAP/CNRS/UT3/CNES/SRON/NASA GSFC/Fab&Fab.