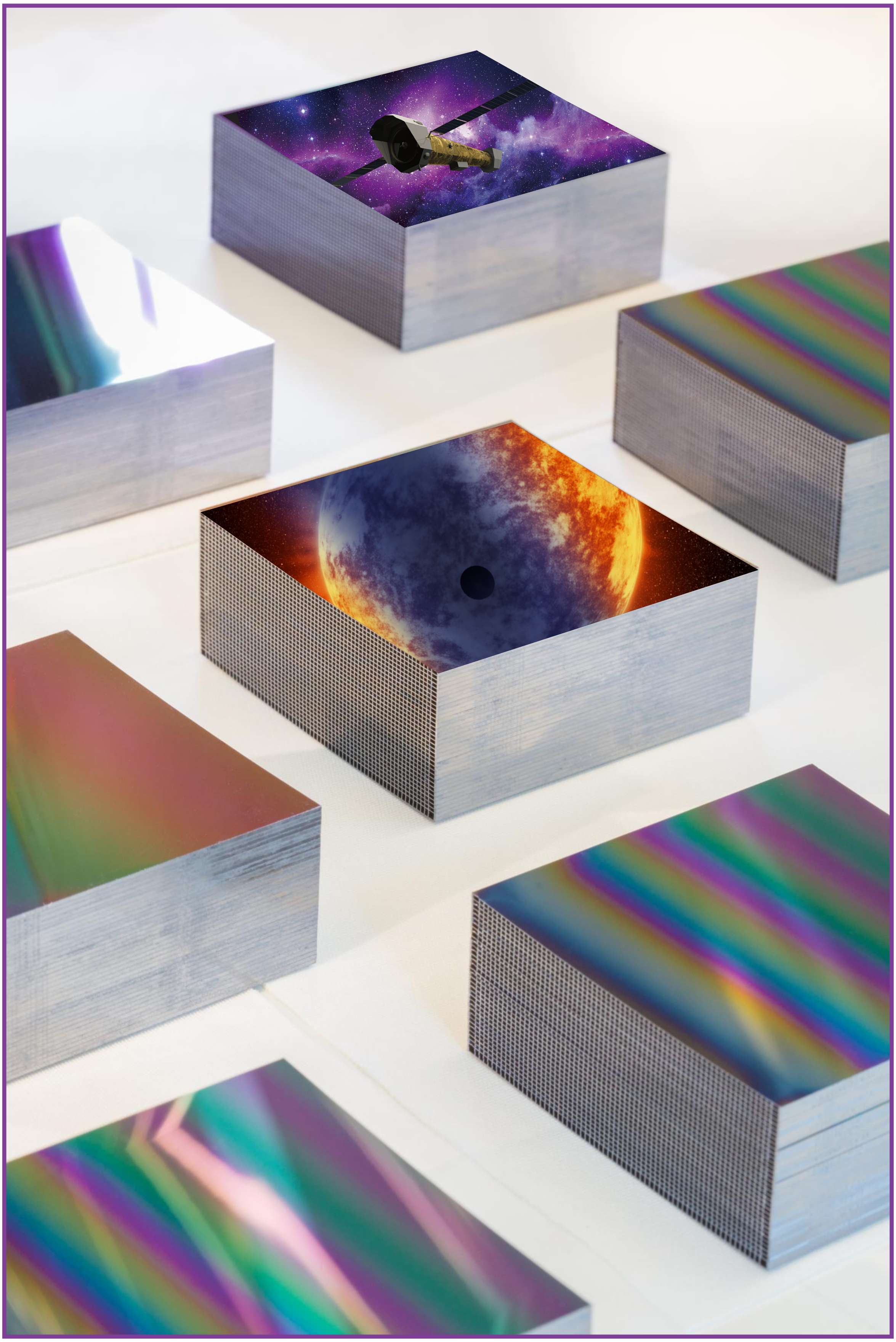
ATHENA Community



Newsletter #7

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Athena X-ray Observatory

*Front Cover image credits: Background image: Silicon pore optics stacks (Credit: cosine Research/ESA). Top image: Artistic impression of the *Athena* X-ray observatory. (Credit: IRAP, CNES, ESA& ACO). Middle image: An artistic impression of a planet erosion as an effect of X-rays ionizing irradiation from the corona of a low mass star.(Credit: NASA, ESA, and A. Feild (STScI). Bourrier et al. 2018, A&A 620, A147).

Welcome

K. Nandra (ASST Lead Scientist) on behalf of the Athena Science Study Team (ASST)

Dear Members of the *Athena* Community,

It is a pleasure to welcome you to this seventh edition of the newsletter with the truly satisfying news that, after around four and a half years, *Athena* has completed its Study Phase. At the system level, the Mission Formulation Review (MFR) that ends Phase A ended in November, with the instruments passing successfully through their own first major reviews in October 2018 (WFI) and April 2019 (X-IFU). Congratulations are due to all involved, as we move on to the Preliminary Definition (B1) Phase and towards mission adoption in late 2021. More details on recent progress are provided in the mission and instrument updates.

This year's Nobel prize for physics was shared between Jim Peebles, for his work on cosmology, and Michael Mayor and Didier Queloz for their exoplanet discoveries. *Athena* will have a lot to say about both topics, but the contribution of X-rays to the latter subject one is highlighted in our science nugget, while our technical nugget focusses on the ground segment.

Most of you will know that XMM-*Newton* has recently celebrated 20 years since launch. We owe that success, as well as the genesis of *Athena* to a group of visionaries of European X-ray astronomy, one of whom we sadly lost recently. The life and work of Giorgio Palumbo is celebrated in an article here by Massimo Cappi. Giorgio influenced and inspired many young scientists, many in the *Athena* team and including Massimo himself, and he will be sorely missed. We are honoured and proud to be carrying forward Giorgio's legacy.

Giorgio (1939-2018) and Athena (1998-?)

Massimo Cappi (INAF/OAS Bologna, Italy)

For many (certainly more than 50!) Italian astrophysicists presently working in Italy or worldwide, Giorgio Palumbo has been a mentor and one of the major reasons why they chose to specialize in astrophysics (covering almost all the fields, from high energy astrophysics to astronomical technologies, from molecular astrophysics to radio and optical astronomy…). A lot has been written in his memory, even if mostly in Italian, (one example and another), and even an asteroid was renamed "Giorgiopalumbo" in his memory. But here I would like to spend a few words to remind us of what Giorgio's role has been for *Athena* specifically because his contribution has been major.

For me, all of the "*Athena* business" started in 1998 when I received an email from Martin Turner, on behalf of the XEUS Coordination Committee (chaired by G. Hasinger and composed of J.Bleeker, J.Truemper, A.Peacock, M.Turner, and of course G. Palumbo). At the time, I was sceptical of accepting significant duties for something that was supposed to fly after more than 20 years, if ever. But as it has happened so often in my carrier, Giorgio's vision of the future - no, of the distant future - convinced me that the challenge of contributing to building the next generation large X-ray observatory (at a time when BeppoSAX was just launched, while *Chandra* and XMM-*Newton* not yet on their launchpad!) was certainly worth the risk. As on other occasions, he was right, and I never regretted having followed his advice.

Giorgio was also visionary in building the right team of people. Among the few Italians who joined the early XEUS team, Luigi Piro is now leading the Italian contribution to *Athena* and is co-PI of X-IFU, Andrea Comastri is now leading the Italian contribution to the WFI, and his ex-student Giovanni Pareschi is now leading the Italian contribution to the *Athena* mirror technology. With his distinctive verve, Giorgio was also key in enabling international collaborations, and maintaining the focus on the final, even if long term, the goal of a very large X-ray Observatory.

The role of Giorgio in the first XEUS concept, which was supposed to “grow” mirror petals on the Space Station with the help of the Canadian robotic arm, was key. Giorgio brought the XEUS idea to an ESA Science committee, which was coordinating the scientific uses of the Space Station. He convinced them to allow financial support to the ESA study and technological activities to start, notably on the mirrors, and to enable the XEUS team to meet and start working together at the international level.

Then came the years when XEUS was merged with the US Constellation-X team to form the IXO project, which was proposed in the 2010 US Decadal Survey but turned down on account of its cost. The US-ESA teams then split again to allow the ESA-led *Athena* own concept to be proposed as L1 in the ESA Cosmic Vision 2015-2025. Again, it was turned down in 2012, this time in favour of a mission to Jupiter and its icy moons (Juice). This period was a very dark, and I would say, a dramatic period for the XEUS team and for the X-ray community at large, for which no clear future was foreseen.

Again, Giorgio’s vision and ability to get things done helped pull us through, this time with the help of his old friend Giovanni Bignami “Nanni” (who was another visionary and with strong political momentum). Together with all the then-competing scientific teams, they managed to convince ESA executives to significantly anticipate the L2 and L3 selections, but only after first, selecting the key science themes of the future. *Athena* was then selected as L2 and LISA as L3. Today, one thing is for sure. Without Giorgio and Nanni, we would maybe never have had *Athena* selected. So, I invite all of you to raise your glasses in memory of Giorgio who is probably watching us now building *Athena* from the stars, and reminding us again that “Doing science is a lot of fun, much better than work!” (cit. Giorgio Palumbo).

Athena Study Status

Matteo Guainazzi (ESA), Didier Barret (IRAP), Kirpal Nandra (MPE) and Randall Smith (CfA), for the Athena Science Study Team (ASST)

The *Athena* mission **has recently passed a critical milestone**: Mission Formulation Review (MFR), marking the **closure of Phase A** and the **transition to Phase B1**. This outcome paves the way to the formal adoption of the mission into the ESA Science Program by the end of 2021.

The scope of MFR was to:

1) Verify the completeness, adequacy and consistency of the mission and Spacecraft (SC) preliminary design, the Phase B1 management plan, and the risk management plan.

2) Verify the completeness, adequacy and consistency of the mission/SC requirements and interfaces.

3) Verify the completeness, adequacy and consistency of the ESA Technology Plan.

4) Verify the realism of the Mission schedule and cost estimates.

The MFR incorporated the results of the Instrument Preliminary Requirement Reviews (IPRR) as input, successfully passed by WFI and X-IFU in October 2018 and April 2019, respectively.

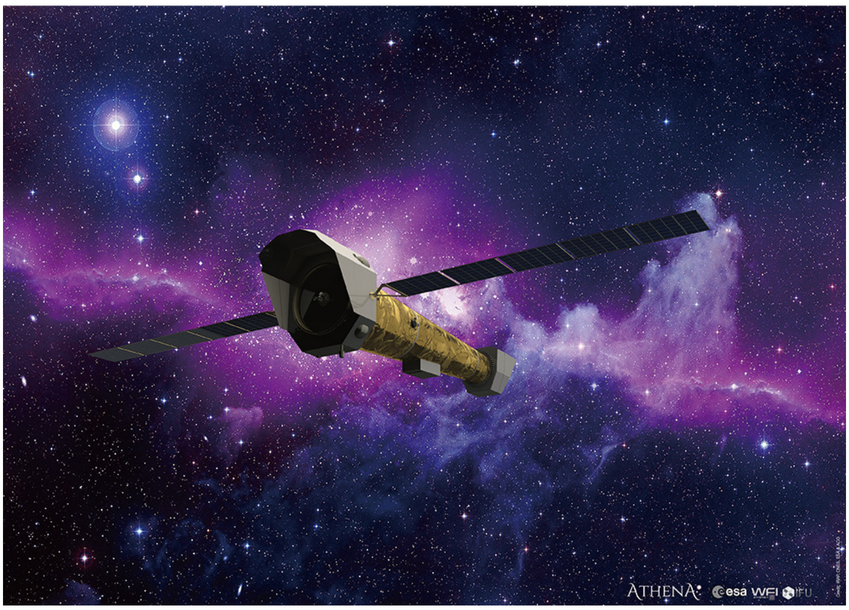
Phase B1 will lead to the consolidation of the mission design to ensure that a robust and scientifically compelling profile is reached at adoption. The overall status of the SC development is in line with the expectations at this phase of the Study. The interfaces between all sub-systems will need to be frozen by the end of 2020. Additional work will be carried out on key Technology Development Activities (TDAs), such as the X-IFU Demonstrator of the Cooling System (DCS; see the X-IFU contribution in this Newsletter), and the X-ray optics.

The international contributions to *Athena* have been further consolidated. During the MFR Board Meeting, it was announced that the NASA X-Ray and Cryogenic Facility is the baseline for the Mirror Demonstrator TDA, as well as for the validation and calibration of the flight mirror. A parallel ESA-funded study of a vertical scanning facility may provide an additional opportunity for (cross-)calibration, as well as for streamlining the schedule of the telescope flight program. The JAXA provision of the 2K/4K Joule-Thompson coolers has been confirmed, after that recent concerns about their life-time have been satisfactorily addressed.

The *Athena* mission relies upon a new X-ray optics technology, Silicon Pore Optics (SPOs), for its combination of angular resolution, high throughput, and low mass. SPO modules are composed of stacks of commercially-procured Silicon plates, which guarantee sufficient production yield during the flight program. The main focus in the *Athena* optics development program remains the improvement of the angular resolution. At the August 2019 SPIE meeting, substantial progress was presented on this front. Measurements from July 2019 indicate a ~10.2 arcsec High Energy Width over 70% of the SPO area. A key innovation has been the successful implementation of a method to trim an SPO to remove the lateral outer sides of a stack, where the angular resolution is degraded relative to the central area, without affecting the overall optical performance. This means that results obtained over the 70% of the area can be assumed *de facto* to correspond to the expected performance over the whole sensitive area of an *Athena* mirror module. Prospects for further progress were reported at the 3rd review of the on-going activity to improve the optics performance (called PRESPO). The main areas of improvement are: the cleaning progress of the individual silicon plates; the wedging process needed prior to stacking to give each module the right curvature, and the stacking recipe. Work is also continuing on the plate over-coating solution. The baseline material (B_4C) remains under study after recent results show that it is more resilient to the plate cleaning process than originally thought. Other materials are being studied as alternatives.

With the new year, the ASST is ready to start in earnest the preparation of the Study Assessment Document (the so-called "Red Book") as an input to adoption. In the last months, trade-off studies have been carried out on the scientific impact of different over-coating materials and on the effects of X-ray stray light. A meeting of the Topical Panel Chairs is scheduled for the first week of March, aiming at discussing the *Athena* science case to be presented in the Red Book. In order for the schedule of *Athena* optics TDAs to match adoption, certain baseline parameters of the mirror modules will need to be frozen at the end of PRESPO (summer 2020). The Red Book will be based on the mission profile derived from the expected performance to be reached at adoption, from which the science requirements and the associated Mock Observing Plan could be updated if needed.

In summary, *Athena* can now continue at full steam toward adoption, with rapid technology improvements consistent with its compelling and exciting scientific case!



News from the Instruments

News from the WFI

A. Rau (MPE, WFI Project Scientist), N. Meidinger (MPE, Project Manager), M. Plattner (MPE, Lead System Engineer), K. Nandra (MPE, WFI Principal Investigator)

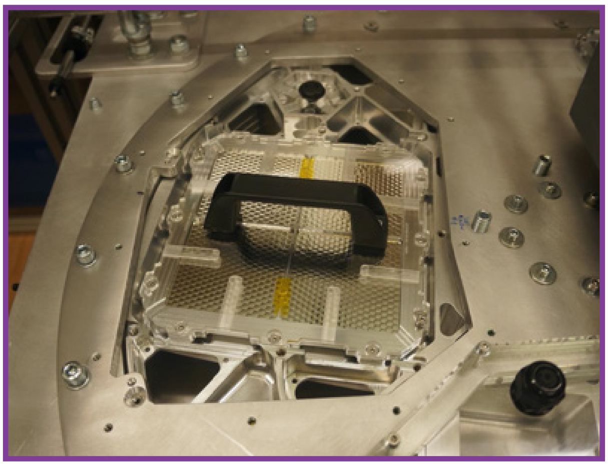
Following the successful Instrument Preliminary Requirements Review in October 2018 the WFI is currently in Phase B (Preliminary Definition). Over the course of 2019 emphasis has been placed on progressing the development of the instrument and impressive progress has been achieved for all critical subsystems.

In summer of 2019, the first batch of the 'pre-flight' DEPFET production was completed at the Semiconductor Laboratory of the Max Planck Society. DEPFETs are the active pixel sensors that form the heart of the WFI detectors (see also Nugget#29). As indicated by the name, this production is anticipated to be the penultimate run, with the DEPFET sensors that will be implemented into the WFI flight hardware to be produced in the next run. Tests are currently being performed at MPE Garching with the aim of consolidating the DEPFET sensor layout and technology in preparation for the flight production. Initial analysis indicates very good performance. The 'pre-flight' production also for the first time provides the team with the full scale 512 pixel x 512 pixel test devices for the Large Detector Array.

The large collecting area of the *Athena* optics coupled with the fast readout times of the WFI detectors (5ms for the Large Detector Array and 80μs for the Fast Detector) result in very high data rates to be processed in real time by the Detector Electronics. In order to demonstrate this capability, a breadboard test setup of the Frame Processor (see also Nugget#35) was developed in 2019. Using digital data from a programmable data emulator, the real-time performance was successfully verified, showing that the electronics can handle sources as bright as 2.5 times the Crab (~195000 photons/s) without losses in the case of the Fast Detector. Additional tests using data generated by a DEPFET are currently ongoing.

With the successful acoustic noise tests performed at the AGH Krakow (Poland) over the summer, a critical milestone was also achieved in the development of the filter and Filter Wheel assembly. These tests, performed with a demonstrator for the Filter Wheel equipped with flight-representative filters, validated the survival at qualification level acoustic loads and verified that a vacuum enclosure is not needed to protect the filters during launch. This marks an important step in the optimization of the instrument within its allocated resource budgets.

2019 also saw two WFI Consortium Meetings, the first (CM#9) was held at MPE Garching, Germany, in March and the second (CM#10) was hosted by the University and the Astronomical Observatory in Strasbourg, France in October.



The WFI Thin Filter Assembly (TFA) integrated with a plexiglass handling tool into the Filter Wheel acoustic demonstrator model during the preparation of the acoustic tests at AGH University of Science and Technology in Kraków. Credit: M. Barbera, WFI Consortium.

News from the X-IFU

D. Barret (IRAP, X-IFU Principal Investigator) and Vincent Albouys (CNES, X-IFU Project Manager)

Shortly after the successful Instrument Preliminary Requirement Review (IPRR) in April 2019, the main activity before the summer break was to consolidate the architecture of the X-IFU cooling chain. This was tackled through a joint ESA-CNES working group. The scope of the activity was twofold: first, to address potential micro-vibration issues induced by the compressors of the coolers; and second, to reduce the number of cryo-coolers. A configuration of the Science Instrument Module (SIM), in which the X-IFU would make a more extensive use of the radiative cooling offered by the cold space was studied. This would have enabled the implementation of two passive cooling stages (at 170 K and 80 K). Unfortunately, such a solution would not lead to a drastic reduction of the number of coolers (6 instead of 9) and compressors (15 instead of 22) but would introduce risks by adding a new type of cooler (a so-called 3K-Joule-Thomson (JT)). Furthermore, this would lead to significant delays in the overall *Athena* schedule, due to the added complexity of testing and verifying the X-IFU in a cold environment.

Consequently, it was jointly agreed by ESA and CNES and the MFR board not to pursue the study further. Instead, we are now working on removing one of the 5 Pulse-Tube coolers, accommodating the cold heads of the coolers into separate cryostat(s), deemed to be beneficial for isolating micro-vibration sources.

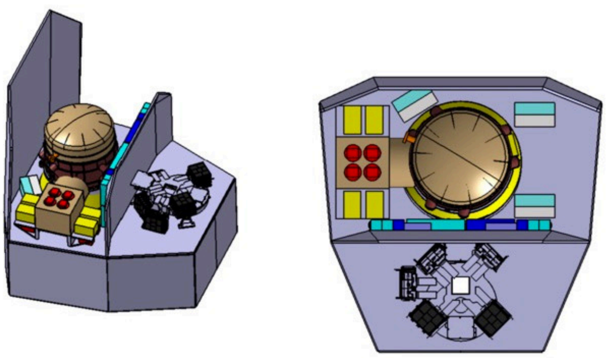
The procurement of the 2K and 4K JT coolers by JAXA to X-IFU, was confirmed following a successful ESA/CNES assessment of their capability to meet the 10 year *Athena* mission lifetime requirement.

The Critical Design Review of the Detector Cooling System (DCS) was held at the end of November. The DCS was pointed out by the MFR board on the critical path for adoption. Finalizing the mechanical and thermal design of the cryostat is a priority. Given the remaining time left before adoption, the objectives of the technology demonstration with the DCS are rescoped.

The X-IFU consolidated schedule is now being ingested in the overall *Athena* schedule, to search for optimization between instrument/spacecraft/science instrument module activities. Now that the instrument baseline is stabilized, we aim to secure the instrument performances (e.g. field of view), but also identify solutions to further improve them (e.g. spectral resolution, instrument quantum efficiency). A detailed assessment of the readout chain performance is thus being carried out both for Frequency and Time Domain multiplexing. The instrument and sub-system requirements and interface definition should be defined in time for System Requirement Review to be held early 2021.

At the last X-IFU Consortium meeting in Toulouse, the issue of reducing the travel footprint of the project was raised, and concrete actions to reduce it significantly were taken. Among those, one may cite reducing the number of Consortium meetings from two to one per year. A travel footprint calculator is available to X-IFU consortium members, e.g. to find out which meeting location minimizes the associated travel footprint.

To conclude, the successful IPRR and MFR clearly put *Athena* on a safe path to adoption. Consolidating the design of the instrument, ramping up on the technology demonstration with objectives consistent with the time remaining before adoption and strengthening the performance of the X-IFU will be the priorities of the X-IFU team in the forthcoming months.



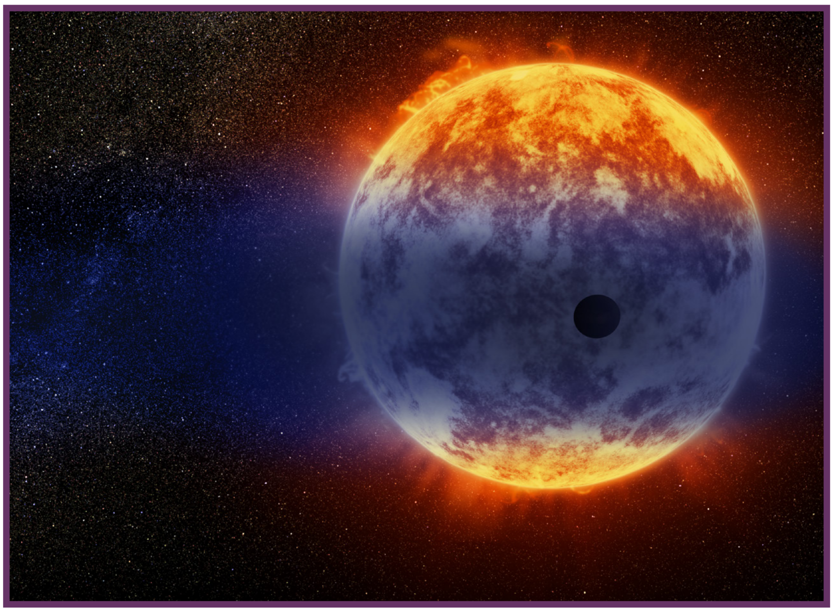
The X-IFU and WFI layouts on the *Athena* Science Instrument Module. The X-IFU design as of December 2019 includes one mini-cryostat accommodating the four Pulse Tube coolers. This is an adaptation of the design presented at the Instrument Preliminary Requirement Review design to specifically reduce perturbations induced by micro-vibrations. This design is still being iterated and likely subject to further modifications. Reference: CNES team (December 2019). Credits: X-IFU Consortium. ©DB/X-IFU.

Extrasolar Planets: a Radiation Diet

Jorge Sanz ,Centro de Astrobiología (CSIC/INTA), Spain

One of the unexpected results of XMM-*Newton* was the relationship found between a star's X-rays emission and its exoplanets. Close-in exoplanets suffer from a strong "erosion" from the incoming stellar high energy irradiation, yielding a mass loss that can be dramatic for less massive exoplanets. Low mass stars, like the Sun, have as their outermost layer the corona. The stellar corona is a hot (between 1 and 30 million degrees) set of magnetic loops that confine stellar plasma, very much related to the stellar activity phenomena. Other manifestations of stellar activity are photospheric spots, flares, and coronal mass ejections. The corona emits copious X-ray and extreme-ultraviolet (EUV) photons. Energetic photons with wavelengths shorter than 912 Å (X-ray and EUV photons) have enough energy to strip electrons from hydrogen atoms. These photons heat and expand the exoplanet's atmosphere, leading to its eventual loss as it escapes the gravitational field of the exoplanet. This leaves the now charged ions at the mercy of the stellar wind, which can rapidly remove them. Evidence of planet atmosphere "evaporation" has been found in cases such as GJ 436 b or WASP-69 b through the UV line H Lyman alpha, or the infrared helium triplet (the latter is also directly related to irradiation by the stellar X-rays).The observed distribution of mass and radius of exo-planets shows also patterns indicating that planet erosion could be acting strongly on the evolution of Neptune-mass planets (the "Hot Neptune Desert"), or planets with few times the mass of Jupiter.

The role of the X-rays is essential to understand the phenomena that yield planetary atmospheric erosion, and even the evolution of the mass and size of those planets orbiting their host stars in short-period orbits. As new exoplanets with increasingly lower masses are found, the subject becomes more interesting, as it approaches the evolution of Earth-mass planets in close-in orbits. The higher sensitivity of *Athena* will improve our knowledge of the X-ray emission of exoplanet host stars. Its capacity to acquire high-resolution spectra in stellar fields will also be used to construct better coronal models. Current research in exoplanet atmospheres already requires the use of this coronal modelling to understand stellar radiation in the X-rays and EUV. *Athena* will have an important word to say about exoplanet atmospheres.



Planet erosion as an effect of X-rays ionizing irradiation from the corona of a low mass star. The mass being lost from the planet forms a sort of comet-like tail that is observed in Lyman alpha or the He line at 10830 Å. Artistic impression. Credit: NASA, ESA, and A. Feild (STScI). Bourrier et al. 2018, A&A 620, A147.

On the Athena Ground Segment

Michael Watson[1] and Natalie Webb [2] , 1) University of Leicester, United Kingdom, 2) IRAP, France

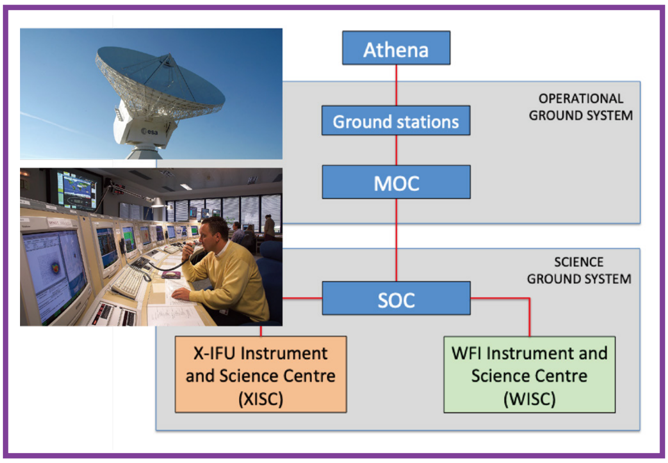
The term "ground segment" is used in space missions like *Athena* to describe all the elements needed to operate and monitor the spacecraft and instruments, to downlink the data to the ground, to plan the observations and carry out data processing of the observational data. An effective ground segment is an essential part of any project's success. In the case of *Athena*, its operations present no unusual requirements and can be met with a standard ESA ground segment approach, but the software needed for the science data processing and analysis needs to match the sophistication of the advanced technology on which *Athena*'s instruments are based.

The *Athena* Ground Segment illustrated schematically in the figure, follows the successful models adopted for XMM-*Newton* and *Herschel*. It consists of the ESA ground station network, a Mission Operation Centre (MOC), a Science Operations Centre (SOC), and two Instrument Science Centres (ISCs), one each for *Athena*'s two instruments, the Wide Field Imager (WFI) and the X-ray Integral Field Unit (X-IFU). The MOC and the SOC will be provided by ESA, whilst the two ISCs will be funded by the ESA member states. The MOC is responsible for all aspects of the command, control and maintenance of the spacecraft, whilst the SOC will be the interface with the scientific user community (e.g., mission planning, calls for observing proposals, science archive, user support) and will be responsible for the overall coordination of the *Athena* Science Ground Segment (ASGS).

The two ISCs will be responsible for calibration and performance monitoring of their respective instruments and more generally for ensuring their successful operation. But equally importantly they will be responsible for the science analysis software required to maximize the potential of *Athena*, as well as the processing of all *Athena* observations to produce a standard set of data products. Parts of the ASGS common to both instruments (e.g., data access libraries) will be developed jointly by the SOC and the ISCs.

The ISCs have already been established. The overall concept for both is that their activities will be undertaken by a distributed collaboration of European institutes, together with NASA-funded contributions. For the WFI, its wide field of view coupled with *Athena*'s high sensitivity means that some of the challenges for the WFI science software include optimizing the source detection software and developing sophisticated techniques for accurately determining the image background. For the X-IFU, its very high imaging spectral resolution will provide a wealth of diagnostics on gas bulk motions, chemical abundances, and spatial distribution, along with a physical characterisation of the different targets. To achieve this, our understanding of the many atomic processes behind the spectral features will need to be improved and innovative software to exploit the abundance of new information will need to be developed.

In addition to this ASGS our international partners (JAXA, NASA) may host a local facility to support their national community.



Schematic of the *Athena* Ground Segment (Credit: M. Watson & N. Webb). Top photo: ESA Cebreros antenna (Credit: ESA). Bottom photo: XMM-*Newton* Science Operation Centre (SOC) located at the European Space Astronomy Centre (ESAC) (Credit: ESA).

3-D spectroscopy from sub-mm to X-ray: the promise of Athena in the 2030s multiwavelength context:

A special session at EWASS 2019

Matteo Guainazzi (ESA), Didier Barret (IRAP), Silvia Martínez-Núñez (IFCA)

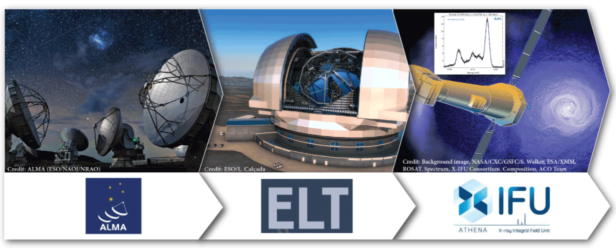
At the EWASS 2019, the *Athena* Science Study Team conveyed a Special Session aiming to bring together theoreticians, observers and data analysis experts on 3-D spectral data to review the potential of the synergies between the *Athena* X-IFU and 3-D spectroscopic facilities from the sub-mm to the optical band. The session gathered more than 50 scientists during two full half-days. The scientific program was structured around 8 review talks with a few contributed talks, and plenty of time for discussion. The presentations are available at the *Athena* Community Office web portal.

One of the illustrative cases where the combination of X-IFU and IFUs at other wavelengths will bring revolutionary discoveries lies in the understanding of Active Galactic Nuclei (AGN) outflows. The most powerful of these outflows, characterized by sub-relativistic velocities and column densities close to the Compton-thick regime where they originate, have been proposed as the ultimately responsible for AGN feedback. AGN outflows arise intrinsically as multi-phase plasmas. They are seen across the whole electromagnetic spectrum, from X-rays to sub-mm. Each phase corresponds to a characteristic spatial scale, from a few hundred gravitational radii to kpc, respectively. The *Athena* WFI survey will detect a large number of powerful AGN outflows up to z~3. Determination of the velocity and column density structure, via follow-up observations with the X-IFU will enable the mass and kinetic energy of the outflow to be accurately measured. Combining information derived from X-ray observations and those characterizing the ionized gas and molecular phases is critically required to understand the acceleration mechanisms of the outflow across the whole spatial scales.

Similarly, in the local Universe (z≤0.2), spatially-resolved spectroscopy of the outflowing gas with the X-IFU, combined with measurements with 3-D optical IFU or ALMA observation will trace the velocity field of the ionized gas and molecular phases. Each X-IFU pixel will record the physical conditions of shocks in the Interstellar Medium (ISM). They, in turn, can be related to the properties of the wind to investigate the nature of its interaction with the ISM, or to the stellar velocity field that could be affected by this interaction.

Powerful winds can also be driven by Supernovae (SNe) explosions. X-IFU will map the metallicity structure of the ISM in starburst galaxies hosting powerful winds. This will be then compared with the chemical abundances of the obscured stellar population that trace the pre-burst gas composition. This comparison will allow us to trace the history of ISM chemical enrichment by SN-driven winds.

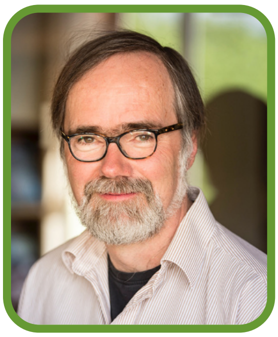
One of the main drivers of the whole *Athena* spectroscopic science case is the direct measurement of the structure of the turbulent velocity field of the hot halos in galaxies, groups and clusters. Measuring the velocity dispersion in different phases, JWST or the ELT, VLT/MUSE, SINFONI and SKA will allow *Athena* to constrain a model of gas condensation and accretion and ultimately feeding of the gargantuan black hole sitting at the center of the bright elliptical galaxy. In high-redshift clusters, observations with the X-IFU and BlueMUSE (future enhancement in the 350 and 600 nm wavelength range) will enable the study of the interplay between the cold flow needed to feed and replenish galaxies and the hot media.



Athena Community People

Jan-Willem den Herder

J.W.A.den.Herder@sron.nl



Jan-Willem den Herder has been over 30 years involved in high-energy missions. He took part in the realization of the Reflection Grating Spectrometer (RGS) on XMM-*Newton* which is now operational for 20 years. The next logical step was to realize the similar quality of the spectra but now for spatially extended sources.

The main scientific interest of Jan-Willem is to detect the very weak emission in the cosmic web which can be found in the filaments between clusters. Whereas current instrumentation is able to identify this gas under the most favourable conditions, a proper mapping requires a much more sensitive instrument such as the X-IFU on *Athena*.

Jan-Willem is leading the SRON group which has pioneered the cryogenic X-ray calorimeters in Europe and he is co-PI of the X-IFU instrument. After many years, the *Athena* mission is now becoming a reality and he will be really happy when the results will be obtained by the next generation of scientists.

Mara Salvato

mara@mpe.mpg.de

Mara Salvato is a member of the scientific staff of the High Energy group, at the Max-Planck Institute for Extraterrestrial Physics in Garching, Germany. She works mostly on evolution of X-ray selected Active Galactic Nuclei (AGN), also in relation to their host galaxies and the surrounding environment. She uses large multiwavelength datasets like those offered by e.g., COSMOS, CANDELS, Euclid, and SDSS surveys, of which she is an active member.

Currently, she is deeply involved in the analysis of eROSITA data that it is performing an all-sky X-ray map of the sky, 25-30 times deeper than its predecessor, ROSAT. For eROSITA, she is chair of the Follow-Up working group and she is coordinating the determination of the counterparts of the point-like X-ray sources and their distance from us.

Mara is fascinated by the brain and how it learns and can be tricked. In her free time, she creates hand-made things, from bread to jewellery.

Mara is co-chair of the *Athena* topical panel "Multiwavelength synergy".

Giovanni Miniutti

gminiuti@cab.inta-csic.es

Giovanni is a researcher at the Centro de Astrobiología (CAB, CSIC-INTA) in Madrid, where he is the coordinator of the Galaxy Formation and Evolution group.

His research focuses on the study of accreting black holes with an emphasis on Active Galactic Nuclei. His main scientific goals are to understand how supermassive black holes accrete matter from their surroundings and how they evolve over cosmic time together with their host galaxies. He pays special attention to the behaviour of accretion flows in the immediate vicinity of black holes and to the relativistic effects occurring there. He particularly likes when sources exhibit strong variability, a key tool with which to explore the physics of the accretion flow around black holes and the scaling of its properties with black hole mass.

On *Athena*, Giovanni is a co-chair of the Topical Panel on "The supermassive black hole close environments" and member of the X-IFU Science Advisory Team (XSAT).

Sixth Announcement of Opportunity to join the Athena Community Working Groups/Topical Panels

The yearly call to join the *Athena* Community is open to all researchers with appropriate background and a strong interest in scientific and technical matters related to the *Athena* mission, especially –but not only- to early career researchers.

Candidates fulfilling the above requirements and willing to join the *Athena* Community are invited to fill this form (only one per applicant).

The deadline for applications is **31 January 2020, 14:00 CET.**

The expectation is that appointments to successful applicants will be issued within Q1 2020.

Conferences (January-December 2020)

Athena in Conferences

■ 235th meeting of the American Astronomical Society, Honolulu (USA), 4–8 January. *Athena* X-ray Mission: Multi-wavelength and Multi-messenger Opportunities splinter session, Tuesday 7th of January.

■ Growing Black Holes: Accretion and Mergers, Kathmandu (Nepal), 19-24 April.

■ The X-ray Universe 2020, Noordwijk (The Netherlands), 25 - 29 May.

■ Transient High-Energy Sky and Early Universe Surveyor (THESEUS) conference 2020, Malaga (Spain), 12-15 May.

■ SPIE Astronomical Telescopes + Instrumentation 2020, Yokohama (Japan), 14-19 June.

■ ESO-ESA Joint 2020 Science Workshop: New Science In The Multi-messenger Era, Garching (Germany), 14-18 September.

Coming conferences of interest

■ Mapping the X-ray Sky with SRG: First Results from eROSITA and ART-XC, Garching (Germany), 16-20 March.

■ European Astronomical Society (EAS) Annual Meeting, Leiden (The Netherlands), 29 June – 3 July.

■ 43rd COSPAR Scientific Assembly: Connecting space research for global impact, Sydney (Australia), 15-22 August.

■ ADASS 2020: The Annual Conference on Astronomical Data Analysis Software & Systems, Granada (Spain), 13-15 November.