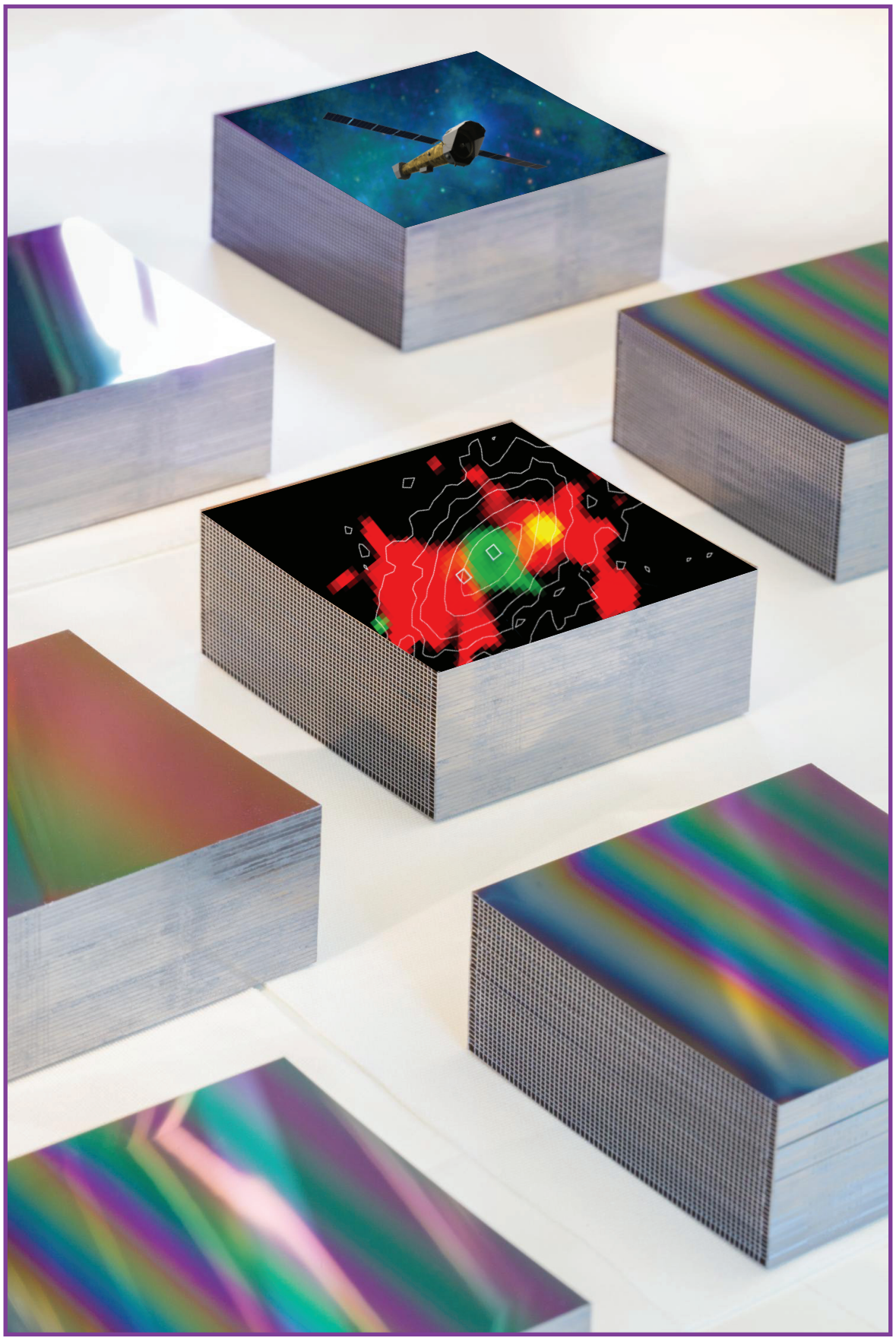
ATHENA: Community



Newsletter #8

November 2020

Contents

Edited by *Athena* Community Office:
F.J. Carrera, M.T. Ceballos, S. Martínez-Núñez, S. Castillo-Rivera
Instituto de Física de Cantabria (CSIC-UC)
Avda Los Castros s/n
39005 Santander (Spain)
http://www.the-athena-x-ray-observatory.eu/
aco@ifca.unican.es
@AthenaXobs
The *Athena* X-ray Observatory
Athena X-ray Observatory

Editorial Board: J. Croston, M. Guainazzi and N. Rea.

*Front Cover image credits: Background image: Silicon pore optics stacks (Credit: cosine Research/ESA). Top image: The artistic view shows *Athena* and Sgr A*, the central supermassive black hole of the Milky Way. The Sgr A* image comes from a mosaic of *XMM*-Newton observations. (Credit: *XMM*-Newton, *Athena* mission: IRAP, CNES, ESA& ACO). Middle image: *Athena* simulated color-coded image of a nearby Seyfert 2. (Credit: Cappi et al. (2013)).

Welcome

Francisco J. Carrera (ACO Director)

In these trying times, with the huge personal and economic cost of the global COVID-19 pandemic, it is with hope and confidence in the future that we welcome the new members of the *Athena* Community, whose membership soars to 945 from all over the world. Additionally, our annual call for new members has just opened, and we hope in particular to attract members from the wider physics community interested in two new Topical Panels on *Athena* Multi-messenger synergies and Physics beyond the standard model, presented in this issue.

We also warmly welcome the new members of the *Athena* Science Study Team, and thank the outgoing members for their hard and inspirational work over the years. The project is looking forward to a renewed impulse from all members, as we ramp up towards updating the science objectives of *Athena* for the Astronomy & Astrophysics special issue dedicated to the mission. These will then be fed into the Red Book, the main input for the Mission Adoption Review (MAR) now postponed to mid 2022. The instrument teams are also progressing apace with a view to their System Requirements Reviews at the end of 2021, and then onto MAR. In all this, the contribution of our international partners, JAXA and NASA, presented in this instalment, is fundamental and greatly appreciated.

We heartily congratulate our colleagues Andy Fabian and Françoise Combes for being awarded the Kavli Prize Astrophysics 2020 in May and the CNRS 2020 Gold Medal in September, respectively, recognizing their many achievements. Andy has been a member of the ASST and is co-chair of the Hot Universe Working Group and Françoise is co-chair of the topical panel on Multiwavelength synergy, their contribution and that of the community is fundamental for the continuing success of the mission.

The scientific importance of supermassive black holes (SMBH) and their wider implication for physics has once again been highlighted by the award of the Nobel prize in physics of 2020 to Robert Penrose, Andrea Ghez and Reinhard Genzel. *Athena* will do groundbreaking work on the discovery and characterisation of SMBH and their immediate surroundings, as well on their effect on their host galaxies, as featured in our science nugget.

We hope that you enjoy your reading.

New ASST and Working Group Chairs

Silvia Martínez-Núñez (ACO Manager)

The *Athena* Science Study Team (ASST) has been restructured by the ESA. Since early October 2020 its composition is as follows:

- Dr. Matteo Guainazzi (Chair)
- Dr. Didier Barret (X-IFU PI)
- Prof. Kirpal Nandra (WFI PI)
- Dr. Massimo Cappi
- Dr. Judith Croston
- Prof. Anne Decourchelle
- Prof. Jan-Willem den Herder (to be replaced by Dr. Elisa Costantini in ~2022)
- Dr. Luigi Piro
- Dr. Nanda Rea
- Prof. Thomas Reiprich
- Dr. Norbert Werner
- Dr. Randall Smith (NASA representative)
- Dr. Hironori Matsumoto (JAXA representative)

We express our warmest gratitude to the outgoing members Prof. Andy Fabian and Prof. Richard Willingale. They deserve huge recognition credit for their contributions from the early concept of the mission to the current mission. Thanks for your hard work, enthusiasm, and scientific vision.

At the level of working group chairs, there have been changes for the "SWG1 The Hot Universe" and "SWG2 Energetic Universe" working groups. Since early October, Dr. Stefano Ettori has become co-chair of SWG1 and Dr. James Aird has replaced Prof. Kirpal Nandra as co-chair of SWG2.

Athena Study Status

Matteo Guainazzi (ESA Study Scientist), Didier Barret (X-IFU PI), Kirpal Nandra (WFI PI)

The *Athena* Study is now in Phase B1. This is a definition phase, leading ultimately to the formal mission adoption in the ESA Science Program. This crucial milestone has been shifted to the spring 2022 meeting of the ESA Science Program Committee (SPC), expected to be held in June. The April 2020 SPC Workshop confirmed that there is no financial or programmatic showstopper to this schedule. This represents a delay of about six months with respect to the schedule at the end of Phase A. This delay is primarily driven by the impact of the global pandemic outbreak on *Athena* industrial activities, as well as a change to the procurement route for the X-IFU cryostat and cooling chain, discussed in more detail in the X-IFU section of the newsletter. This requires an additional design cycle of the Science Instrument Module (SIM).

The industrial Studies – now split in two parallel pairs of contracts covering the spacecraft and the SIM, respectively - proceed nominally. The large suite of technology development activities continues. Recent milestones of note are the successful Test Readiness Review of the magnetic diverter, which is designed to reduce the background by deflecting soft protons and the end of the design phase of the vertical scanning calibration facility (VERT-X), which forms part of the mirror calibration planning.

A new geometry for the mirror has been baselined, which has an outer diameter set to 2512 mm and features a smaller number (~600) of larger mirror modules. The latter improves the aperture usage efficiency. The most recent estimates of the mirror effective area indicate a possible shortfall of about 10% at 1 keV and about 15/30% at 7 keV (WFI/X-IFU) with respect to the nominal effective area requirements (assuming the instrument efficiencies endorsed by the Instrument Preliminary Requirements Review). Activities are on-going to recover at least part of this shortfall through further optimization of the geometrical parameters of the mirror modules. The *Athena* Science Study Team (ASST) held in October 2020 a workshop to review the recommendation on the mirror coating prescriptions, to ensure that they optimize the science return of *Athena* in light of these updated performance estimates.

The activity to improve the silicon pore optics angular resolution proceeds nominally. Recently, Ion Beam Figuring has been proven to deliver comparable performance to the chemical-based wedging of the SPO. This may contribute to significantly reducing the "entry-and-exit" effects degrading the angular resolution, because chemical wedging leaves a residual Silicon Oxide layer that buckles the plates. New metrology systems were also introduced to reduce the meridional curvature errors in the stacking process. Measurements of individual samples show that the curvature is now consistent with the required tolerances. Mirror modules at two radii successfully passed vibration qualification tests. New X-ray measurements are expected once the Bessy facility opens again after a prolonged shutdown due to COVID-19.

In summary, the *Athena* Study proceeds smoothly on the way to adoption. The main contribution of the scientific community to this process is the Definition Study Report (more commonly known as the "Red Book"). The ASST is expected to deliver this document by mid-February 2022. Readers are referred to the specific section of this Newsletter for a description of the Red Book content and of the process and schedule agreed by the ASST for its preparation.

Red Book and *Athena* Special Issue

Matteo Guainazzi (ESA Study Scientist)

The formal "adoption" of *Athena* as part of the Science Program of the European Space Agency (ESA) will be achieved after Mission Selection Review (MSR), currently scheduled to kick-off in the first quarter of 2022. As part of the data package for MSR, the *Athena* Science Study Team (ASST) must deliver a "Definition Study Report". This document – colloquially known as the "Red Book", from the old times when it was a printed document with a red cover page – constitutes a synoptic and holistic description of the *Athena* mission. Its core is a compelling description of the *Athena* scientific case and requirements, as well as of the mission design (payload, operations, ground segment).

The Red Book is an ESA document based on a standard template, where about 1/3rd of the ~ 120 total pages are allocated to the presentation of the *Athena* science. The ASST relies on inputs by the *Athena* community Topical Panels to prepare this document. The ASST has proposed a schedule, whose main milestones can be summarized as follows:

- Early 2021: the ASST defines the Red Book Table of Contents, detailing the expected contributions by each Topical Panel
- ≤31 May 2021: Topical Panel Chairs deliver the first version of their contributions
- ≤31 July 2021: The ASST reviews these inputs, asking for amendments and modifications as deemed pertinent
- ≤31 October 2021: The Topical Panel Chairs deliver their final version of their contributions
- ≤28 February 2022: The ASST delivers the Red Book to ESA

Before and between these milestones, the ASST will welcome the opportunity of holding discussions and iterations with the Topical Panel Chairs as appropriate.

In order to support the adoption process, and to ensure a strong engagement, involvement, and visibility of the whole *Athena* community, the ASST has negotiated with the Astronomy & Astrophysics (A&A) Editorial Board the publication of a Special Issue on *Athena* science. Following an extraordinarily successful community call for ideas, a list of about 80 papers has been agreed with A&A. The schedule for the preparation, internal review and submission of these papers is as follows:

- ≤30 June 2021: a draft version of all papers shall be submitted to the ASST for an internal review process
- ≤31 July 2021: the ASST communicates the results of the review process to the paper first authors
- 15 September 2021: submission deadline to A&A
- ≤15 June 2022: The A&A Special Issue is published

The ASST plans to deliver at the beginning of 2021 the set of payload responses enabling the scientific simulations for the Red Book and the A&A Special Issue, based on parameters describing a mission profile agreed between ESA and the ASST.

The ASST acknowledges that the schedule for these activities is very tight. This is partly driven by the need of ensuring as much time as possible for the *Athena*-related technological developments, in order to achieve the highest level of maturity prior to adoption. **The ASST is extremely grateful to the whole *Athena* community, and in particular to the Topical Panel Chairs, for the support in this process!**

News from the Instruments

News from the WFI

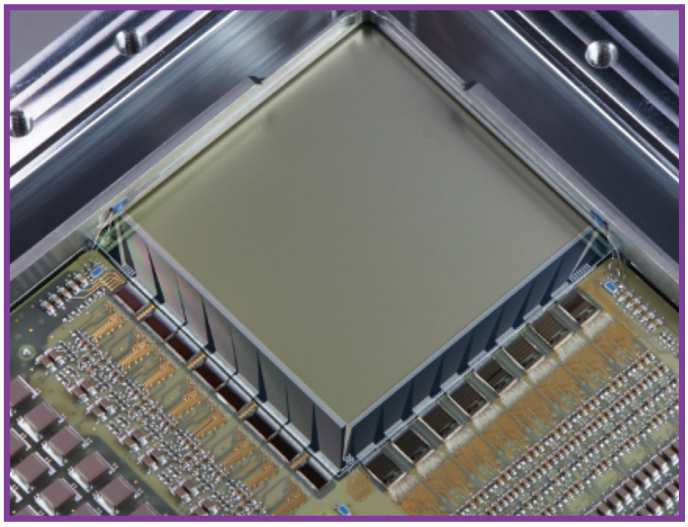
Arne Rau (WFI Project Scientist), Norbert Meidinger (Project Manager), Marcus Plattner (Lead System Engineer), Kirpal Nandra (PI)

The year 2020 has certainly been unusual and challenging, with the pandemic affecting many aspects of work and life in general. The resulting constraints have inevitably also affected the WFI instrument development, with many laboratory activities having been essentially on hold between mid-March and July. Since then, the development activities have resumed and are advancing steadily through the instrument phase B (Preliminary Definition) with significant progress being achieved for most critical subsystems. The next major milestone will be the Instrument System Requirement Review scheduled for the end of 2021.

Following the completion of the first batch of the 'pre-flight' DEPFET sensors in 2019 (see also Newsletter #7), device testing is currently ongoing at MPE in Garching. The systematic analysis of 64x64 pixel devices operated under flight-comparable conditions has demonstrated impressive spectral performance (130eV FWHM at 5.9keV), surpassing the science requirements. In addition, laboratory modules to test the first full-scale 512x512 pixel DEPFET devices for the Large Detector Array (LDA) have been set up and are currently being validated.

The development of the readout (VERITAS) and control (Switcher) ASICs necessary for the operation of the DEPFETS has focused on the need to transfer to a new semiconductor fabrication process. Test structures have been manufactured and are being analyzed. The Camera Head structural and thermal design has been optimized, including improvements to the interface temperatures as well as a significant reduction of the heat loads. The changes have also provided a reduction of the gap width between the four detectors of the LDA by more than 25%, directly translating into a further enhancement of the field of view-averaged effective area of the WFI.

After the successful acoustic noise tests of the filter and Filter Wheel Assembly reported in 2019, subsequent vibration tests were originally foreseen for April 2020. As a result of the imposed travel restrictions, these tests were delayed, but are now proceeding. Demonstrating the compliance of flight-representative filters under qualification-level vibration load is a necessary condition to achieve TRL 5 for the Filter Wheel subsystem. 2020 also saw the WFI Consortium Meetings #11 in April and #12 in November, both held entirely in the virtual space.



Full scale 512 pixel x 512 pixel DEPFET sensor from the WFI pre-flight production mounted on a detector board. Blocks of eight readout ASICs (right) and eight control ASICs (left), each operating 64 columns or 64 rows, respectively, can be seen connected to the sensor. The WFI instrument will use 2x2 of these detectors to fill the 40 arcmin x 40 arcmin field of view.

News from the X-IFU

Didier Barret (X-IFU PI) and Vincent Albouys (Project Manager)

Since the start of 2020, the X-IFU underwent two major changes: the first one affects the Transition Edge Sensor Array readout scheme. Following an internal assessment, the new baseline readout was selected to be Time Domain Multiplexing (TDM), a readout technique developed by the NASA-GSFC/NIST/Stanford groups. In the lab, TDM has demonstrated spectral resolution performance consistent with that required for X-IFU, namely 2.5 eV up to 7 keV. The second change affects the cryostat and the cooling chain that are now being provided by ESA through the same industrial contract covering the *Athena* Science Instrument Module (SIM). The X-IFU cryostat and cooling chain are being studied by two competing industrial Primes (Airbus Defense and Space and Thalès Alénia Space). The newly defined X-IFU perimeter includes the so-called 2K core (Focal Plane Assembly, Sub-kelvin cooler and the cryogenic harness), plus the readout, control and power electronics. Exchanges of information between X-IFU and the Primes are formalized into an Interface Requirement Document, and through two-party meetings, supported by ESA appointed working groups. The X-IFU cryostat and cooling chain are key drivers of the X-IFU performance, hence a strong interaction and some flexibility in the communication is being installed between the Primes and the CNES project team.

Adjustments in the overall X-IFU Consortium organization due to the changes of the cryostat and cooling chain procurement scheme are being assessed by the Consortium Management Team and the Consortium board. Most notably, Spain, Japan, Poland, Czech Republic and Belgium are potentially impacted by the change.

The X-IFU development schedule is being iterated with ESA. The next major milestones are the Instrument System Requirement Review in October 2021, followed by a Preliminary Design Review in August 2023, and a Critical Design Review in January 2026. The flight model delivery of X-IFU to ESA is now scheduled for May 2029. That is more than 3 years before the current launch date. ESA expects the interfaces between the X-IFU and the cryostat to be frozen by April 2021, as required for industry to produce its Science Instrument Module data pack by February 2022, at the time when the mission adoption review starts.

The technology demonstration plan is being updated to reflect the re-scoping of the Demonstrator of the Cooling System, the changes in the cryostat procurement scheme, and the changes in the readout scheme. It now includes an activity in which the Demonstration Model of the Focal Plane Assembly (FPA) is being integrated with the sub-kelvin cooler and submitted to the environment of the flight system. These activities will be completed after the Mission Adoption Review and will be supported by a series of tests at sub-system levels (susceptibility of the FPA to micro-vibrations to be performed at SRON, Electromagnetic Compatibility (EMC) susceptibility of the TDM readout to EMC to be carried at GSFC).

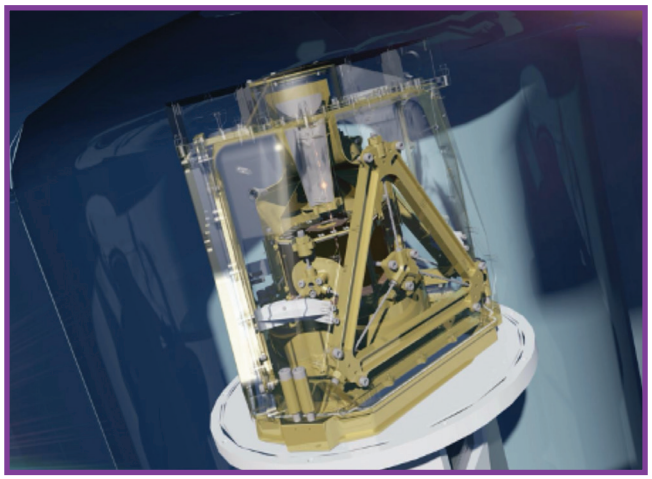
At the time of this writing, the X-IFU still meets its top-level performance requirements in terms of spectral resolution, field of view, count rate capability. The release of X-IFU resources, e.g. response files, will take place after the consolidation of some key assumptions in the mirror response (e.g. rib spacing, coating, wedging scheme, membrane thickness) and will fold in a new definition of the instrument efficiency with updated parameters, e.g. pixel yield, deadtime induced by the cryogenic anticoincidence. This will enable the community to start working on the Astronomy and Astrophysics special issue papers as well as for the red book. A consolidated set of resources will be delivered in early 2021.

In its constant effort to improve the working efficiency throughout the X-IFU Consortium, the X-IFU management has set-up Working Groups on three topics: the instrument performance, the detection chain and the system interfaces. Those working groups co-led by CNES and SRON in each case involve field the world leading experts of the Consortium. who report on their activities to the project management each month during the Project Manager meetings.

After turning the eleventh Consortium meeting, originally planned to take place in Liège, into a virtual meeting, it was decided to have a second virtual meeting in November, to ensure that momentum is kept within the Consortium and that everyone is up to date with the latest changes in the project. Physical interactions are missed, but the daily project activities do not seem to suffer too much from these new ways of working. Lab work on the other hand is being affected, as, in most places, physical presence in the labs is limited, slowing down some hardware developments.

The X-IFU leads remain committed to monitoring and ultimately reducing the environmental footprint associated with the development of the X-IFU, and take actions to make it a subject of discussion within the Consortium. As an example, during the 12th X-IFU Consortium meeting in November, Dr Céline Guivarch, a member of the French High Council on Climate (HCC) presented in the plenary sessions an inspiring talk entitled climate changes and raising social inequalities. The HCC advises and gives recommendations to the French Government on the implementation of public measures and policies to reduce France's greenhouse gas emissions.

In May 2020, a new X-IFU movie was also released on the X-IFU YouTube channel. It offers a deep dive into the heart of the instrument, the X-IFU detection chain: from the photon hitting the absorber to the end of the event processing. The video is available in English, French, and Italian, and subtitles in several additional languages are included.



This is an artist's impression of the full X-IFU's 2K Focal Plane Assembly as pictured in the second X-IFU video. Credits: X-IFU Consortium.

News from JAXA

Hironori Matsumoto (Osaka University)

Since *Athena* is the only large X-ray observatory in the 2030s, the High-Energy Astrophysics Association in Japan places *Athena* as the most important project after XRISM (X-ray Imaging and Spectroscopy Mission) in its future road map. The Japan Aerospace Exploration Agency (JAXA) is planning to contribute to the success of *Athena*. The baseline of the JAXA contributions consists of enhancing *Athena* scientific results and developing X-IFU coolers. We also would like to contribute to the WFI and the mirror.

We believe that new science opened with XRISM is important for *Athena*. XRISM, which will be launched in Fiscal Year 2022, carries an X-ray micro-calorimeter that is a predecessor of X-IFU. The XRISM scientific results will be developed further by *Athena*. The target selection during the XRISM performance verification phase is now ongoing.

We plan to contribute the Joule-Thomson coolers in the cryogenic chain to produce 4K and 2K environments for X-IFU, based on our heritage in space missions. The combination of our coolers with the European sub-K coolers has been evaluated by international collaboration in ESA's core technology program. Following the change of the cryostat and cooling chain procurement scheme, JAXA will supply the coolers as a part of the SIM.

We have done a feasibility study for manufacturing some of the Detector Electronics for the WFI in Japan, and obtained positive results. We are then planning to design and fabricate some electronic circuit boards. These boards produce bias voltages that will be supplied to DepFET sensors and front-end ASICs in the camera body.

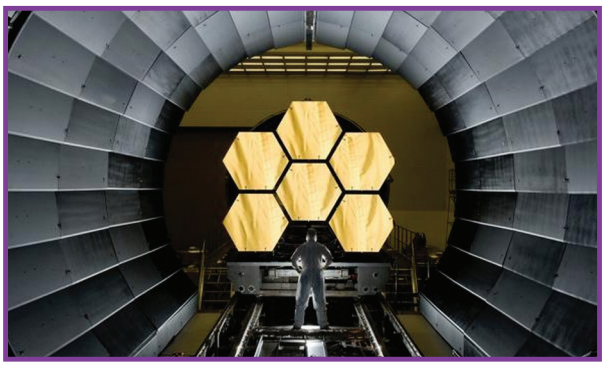
Overcoating of the mirror surface with light elements is effective to mitigate the reduction of the effective area around the Ir edge. However, the overcoating must be compatible with the SPO construction process. We are now doing the basic experimental study of the coating with Diamond-Like Carbon. We have also started to make a trial model of a light-weight baffle for the mirror to reduce the X-ray stray light.

News from NASA

Randall Smith (Smithsonian Astrophysical Observatory)

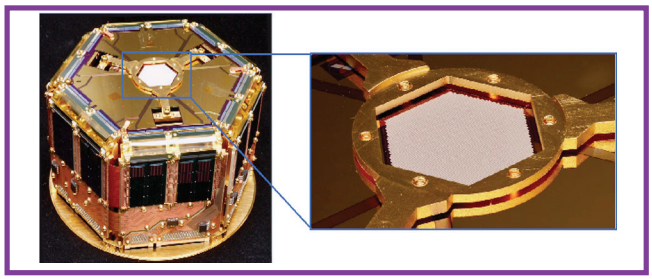
When *Athena* entered Phase B1, NASA moved from a study phase to a NASA/GSFC-led project, and created the NAST (NASA *Athena* Science Team) to provide input to NASA about the science community interests in *Athena*. The NAST plans to have an open 'virtual' meeting early in 2021 with details to be announced.

ESA has chosen the X-ray & Cryogenic Facility (XCRF) at NASA/MSFC as the calibration facility of the Mirror Assembly Module (MAM). NASA has been working with ESA and the Calibration WG on defining the test and calibration requirements of the MAM Demonstrator, Qualification, and Flight model. The XRCF will receive and test the Demonstrator model as early as 2023, with the primary goal of verifying the thermal stability of the mirror structure and alignment of the mirror modules. The Qualification model is expected in 2024/25 and the Flight model in 2028/29.



The X-ray & Cryogenic Facility (XCRF) at NASA/MSFC.

NASA/GSFC will build the X-IFU focal plane array, a hexagonal array of 3,168 pixels on a 275-micron (4.7 arc-seconds) pitch (right-panel of the image below) with spectral resolution of <2.5 eV FWHM (<7 keV). To achieve this, the resolution of individual detectors must be <2.1 eV FWHM, which has now been achieved in kilo-pixel arrays. In early 2020, NASA agreed to also provide the low-temperature read-out using time-division-multiplexing (TDM). With TDM, each set of 33 pixels is read out sequentially and cyclically by a single electronics chain. These critical NASA contributions represent two of the most important new technologies underpinning X-IFU's ground-breaking new capabilities.



X-IFU Focal Plane.

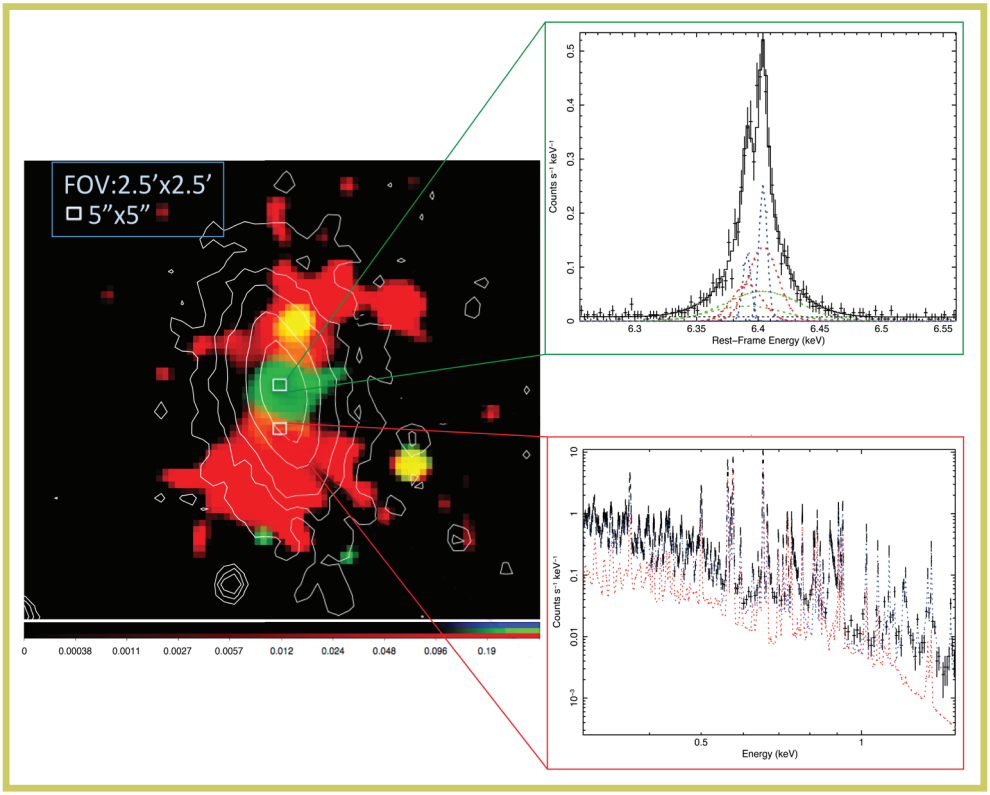
Mapping the Surroundings of Supermassive Black Holes

Stefano Bianchi (Università degli Studi Roma Tre, Italy)

Supermassive black holes (SMBHs hereafter) are ubiquitous in the center of galaxies, including our own Milky Way. Although their gravitational sphere of influence is tiny with respect to that of the total mass of their hosts, their overall impact on the evolution and growth of galaxies is thought to be crucial. This 'feedback' arises when the SMBH accretes matter, becoming an 'Active Galactic Nucleus', or AGN. The matter falls into an 'accretion disk' orbiting the SMBH while converting its gravitational energy into radiation, jets and outflows, which then interact with the surrounding environment from nearby to galactic scales and beyond. A detailed mapping of the neighborhood of SMBHs would represent a huge leap forward in our understanding of the accretion flow around AGN and their key role in shaping the Universe as we know it.

The radiation emitted from the inner parts of the accretion disk around the SMBH interacts with the surrounding gas and gets 'reprocessed', leaving tell-tale imprints in the process. In particular, the photons can be absorbed and re-emitted by atoms, giving rise to spectroscopic lines. The detailed analysis of the energy, strength and profile of these lines allows for a wealth of information on the physical, chemical and kinematical properties of the gas which produces them. X-ray emission, in particular, is a characteristic signature of AGN, and a characteristic signature of AGN, and a unique probe of the inner regions close to SMBHs. Indeed, current and past X-ray observatories have provided an enormous amount of information about accretion flows around AGN and their impact on the host galaxies. However, these data have suffered from intrinsic limitations in the telescope's sensitivity or spectral, spatial, or timing resolution.

Athena will provide a real breakthrough in this field, thanks to the exceptionally high energy resolution and collecting area of the X-IFU, which can be combined with its powerful imaging and timing capabilities. For example, it will be possible to disentangle the velocity profiles of the components of emission lines arising from different regions around the SMBH, together with their distance and geometric arrangement as determined via direct imaging or reverberation mapping. Another exciting possibility would be to quantify the effects of shocks induced by jets or outflows on different scales of the galaxy, in order to see feedback 'in action'. The space for discovery is huge: the surroundings of SMBHs will be investigated as never before.



Left: *Athena* simulated color-coded image of a nearby Seyfert 2 a typical X-ray obscured AGN. The soft X-rays (red) trace a biconical outflow driven by the AGN which impacts all over the host galaxy (indicated by the white contours). Right-top: *Athena* simulated profile of the iron fluorescence line arising from different regions around the SMBH: the X-IFU high spectral resolution allows for the separation of all components. Right-bottom: X-IFU simulated spectrum of a part of the plume of ionized emission south of the nucleus: the contributions from shocked thermal emission and gas photoionized by the AGN can be clearly separated. Figure adapted from Cappi et al. (2013).

Athena Community People

Stéphane Basa

stephane.basa@lam.fr

Stéphane is an astronomer based at the Laboratoire d'Astrophysique de Marseille.

After starting his research in particle physics, in the development of the LCH at CERN, then of the ANTARES high-energy neutrino telescope, he turned to astronomy.

Stéphane is now active in the study of the energetic and transient universe, and has for example participated in the discovery of the first tidal disruption events and the first supernova shock breakouts. Now, he uses gamma-ray bursts to study the distant universe. These objects are really unique beacons for identifying and studying early galaxies, as well as the reionization of the Universe. To this end, *Athena* could provide absolutely unique information.

He is involved in the development of the French-Chinese SVOM mission, in the THESEUS mission proposed as ESA's M5 as well as in the *Athena* mission.

Stéphane is co-chair of the *Athena* Mission Working Group 5.6, Targets of Opportunity.

Nanda Rea

rea@ice.csic.es

Nanda studied physics in Italy, and after many years in The Netherlands, she is now a tenured staff scientist at the Institute of Space Sciences (CSIC) in Barcelona, Spain.

Currently she is running a large research group funded by an ERC Consolidator Grant, focused on studying the reach of the neutron star population in our Galaxy, and their relation with the most explosive Universe events. She works with many X-ray satellites, but keeping an eye also on theoretical modelling.

Nanda is one of the new members of the *Athena* Science Study Team, she is a member of the ESA Astronomy Working Group, and the Chair of the PHAROS COST Action, comprising 200 researchers from 30 different countries working on neutron stars from different perspectives.

One of Nanda's interests is simulating how the X-IFU's high spectral resolution can improve constraints on neutron star equation of state and magnetic field geometry, and how the WFI large throughput can help in identifying Galactic X-ray transients.

Chris Reynolds

csr12@ast.cam.ac.uk

Chris Reynolds is currently the Plumian Professor of Astronomy at the University of Cambridge, UK. Before moving to Cambridge in 2017, he had a 21 year career in the United States; five years as a postdoctoral research associate in JILA at the University of Colorado, and then 16 years on the professorial faculty of the Astronomy Department at the University of Maryland College Park (UMD). While there, he founded and was the first Director of the UMD/NASA-Goddard Joint Space Science Institute (JSI).

Chris has broad interests in observational and theoretical high-energy astrophysics. Much of his previous work has been on black hole accretion disk theory, X-ray studies of strong gravity (including black hole spin) and AGN feedback. More recently, he has developed interests in the use of X-ray astronomy for constraining new particle physics.

Chris has recently become the co-Chair of the new *Athena* Topical Panel on Physics Beyond the Standard Model.

Eighth 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 interesting in joining the *Athena* Community are invited to fill this form.

The deadline for applications is **15 December 2020, 14:00 CET**.

New Topical Panels

SWG3.6. *Athena* Multi-Messenger Topical Panel (AMM-TP)

Luigi Piro

Recent years have witnessed a blossoming of multi-messenger astrophysics, in which gravitational waves, neutrinos and photons provide complementary views of the same source. The great potential of this synergy was indeed realized with the observation of the electromagnetic counterparts to Gravitational Wave (GW) mergers and to neutrino sources. X-ray astronomy plays an important role because X-ray photons are often directly connected to the energetic phenomena producing multimessenger carriers or Very High Energy (VHE) photons. With its unique capabilities, i.e. sensitivity over wide field, Target of Opportunity (ToO) reaction and high spectral resolution, *Athena* will offer a key tool in understanding sources and processes in the multimessenger Universe.

The *Athena* Multi-Messenger Topical Panel (AMM-TP) will bring together scientists from the astrophysical and astroparticle communities to develop the science topics and the associated observational strategy stemming from the synergy of Athena with multi-messenger facilities in the field of GW, neutrinos, and VHE astronomy. The AMM-TP will, in particular, expand on the work done in the *Athena* Multi-Messenger White Paper. The chairship of this topical panel is held – ad interim – by the lead of the *Athena* Multi-Messenger White Paper (Luigi Piro).

SWG3.7. Physics Beyond the Standard Model Topical Panel

Christopher Reynolds and Esra Bulbul

Much of modern fundamental physics is concerned with the question of what lies beyond the Standard Model (SM) of Particle Physics. Dark matter and dark energy are almost certainly manifestations of this new physics, placing such questions at the heart of astrophysics and cosmology as well. Recent years have shown that X-ray astronomy is a particularly important tool for exploring physics beyond the SM. To give three examples, (i) sterile neutrino models for dark matter naturally predict decay lines in the X-ray band, (ii) the axion-like particles (ALPs) predicted by String Theories can imprint observable distortions on the X-ray spectra of AGN in galaxy clusters, and (iii) the "gravitational atom" formed by bosonic orbital trapped in the gravity of an accreting Kerr black hole has a distinct spectral timing signature.

This Topical Panel will draw together astrophysicists and particle physicists to engage in a broad exploration of *Athena*'s potential with regard to probing physics beyond the SM. For each of the possible extensions of the SM, there is a pressing need to assess the impact of *Athena*'s superior spectral resolution and throughput on the accessible discovery space, and realistically assess what would constitute a robust detection given astrophysical and calibration realities.

AHEAD2020 Announcement of Opportunity Cycle 1

The AHEAD2020 (Integrated Activities for High Energy Astrophysics Domain) will call for a program of transnational visits to be started around Spring 2021. The main objectives are:

- fostering new or strengthening existing collaborations in the fields of technology and data analysis (visitor program);
- providing training and/or mentoring on high energy data analysis, use of advanced tools and computational astrophysics;
- providing free access to some of the best European ground test and calibration facilities relevant for high-energy astrophysics.

Visitor grants include full reimbursement of travel and subsistence expenses. To face possible restrictions to travel as an effect of the current pandemic, the possibility of remote access for a number of services in the area of data analysis, tools and computational astrophysics will be provided.

AO-1 Calls Opening: 11 January 2021 **Submission Deadline**: 22 February 2021

For further information and links to the AO-1 calls, visit the AHEAD web portal.

Conferences (December 2020 - July 2021)

- SPIE Astronomical Telescopes + Instrumentation 2020, digital forum, 14-18 December 2020.
- 237th meeting of the American Astronomical Society, online, 11–15 January 2021.
- 43rd COSPAR Scientific Assembly: Connecting space research for global impact, hybrid in-person/virtual event, Sydney (Australia), 28 January - 2 February 2021.
- Transient High-Energy Sky and Early Universe Surveyor (THESEUS) conference 2021, Malaga (Spain), 23-26 March 2021.
- Growing Black Holes: Accretion and Mergers, Kathmandu (Nepal), 18-23 April 2021.
- 15th International Astrophysical Consortium for High Energy Calibration, Pembroke (USA) 26-29 April 2021.
- The First Vasto Accretion Meeting, Vasto (Italy), 30 May-5 June 2021.
- European Astronomical Society (EAS) Annual Meeting, Leiden (The Netherlands), 28 June – 2 July 2021.