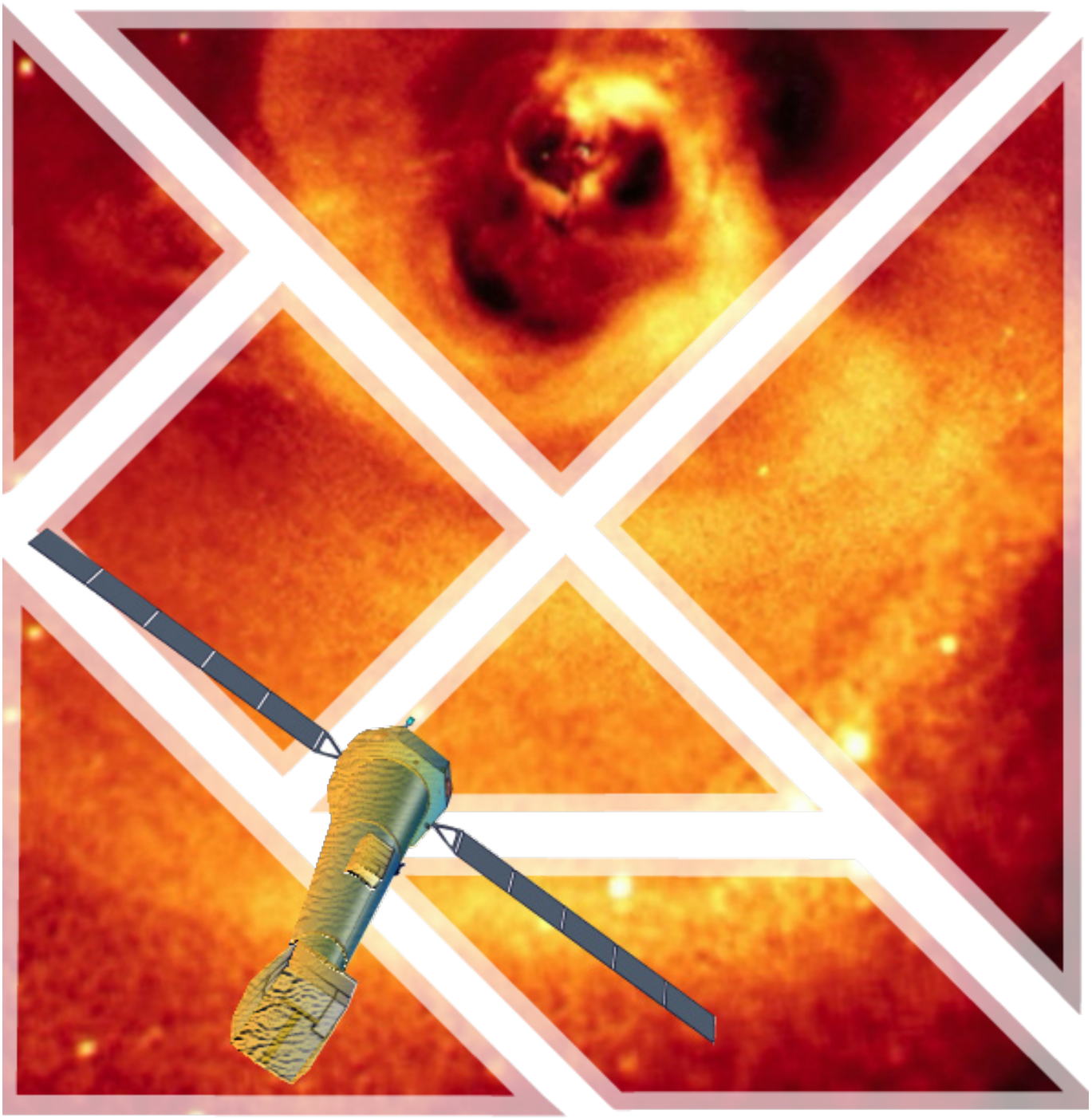

ATHENA COMMUNITY NEWSLETTER #2

DECEMBER 2016

ATHENA

Contents

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Athena X-ray Observatory

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*Front Cover image credit: Athena team, based on a Chandra image matched to the angular resolution of Athena.

Welcome

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

Welcome to the second Athena Community Newsletter. Work on the Phase A study and associated developments has been progressing intensively since our last bulletin, and there are many important items to report.

It is a great pleasure to introduce our next ESA Study Scientist Matteo Guanazzi. We would like to offer a warm welcome to Matteo, who will take over from David Lumb after he retires next year. We are sure you will all join us in thanking David for his excellent work on Athena, and many other missions including XMM-Newton, and wishing him the very best for the future.

This Newsletter includes as usual updates from the project and instrument teams, our synergy exercises and profiles of some individual Athena people showing the human side of the project. There is also a report on the telescope developments from Dick Willingale, in the form of an Athena Technical Nugget.

Of particular note is this issue's Science Nugget from Andy Fabian on the high resolution spectroscopic results from Hitomi. The loss of the Hitomi satellite was a tragic event for the whole astronomical community, but of course especially for our colleagues in the Hitomi team in Japan and elsewhere who worked so tirelessly to implement the mission. The brief but spectacular glimpse that Hitomi has given us into the high-spectral resolution X-ray Universe emphasises that loss, but Andy's article also illustrates the incredible opportunity afforded by this new window. We wish every success to those working towards the Hitomi Recovery Mission and of course look forward to the eventual launch of Athena, whose X-IFU instrument will provide the next dramatic leap in capabilities for spatially-resolved X-ray spectroscopy.

As a final note, we are happy to report that the ACO is now up and running in full force, as testified by the release of this second Newsletter.

Matteo Guainazzi, new Athena Study Scientist

I am grateful for the opportunity to introduce myself to the Athena community. I am Matteo Guainazzi, scientist in the ESA Study Team at ESTEC since September 2016.

Joining Athena has been the last step of a long journey: ASCA, BeppoSAX, XMM-Newton, Hitomi … I have had the privilege to be involved in several aspects of their science operations: mission planning, community support, data analysis software, archiving. In the last 7 years of my 15-years long activity at the XMM-Newton Science Operations Center at ESAC, I was responsible for the calibration of the on-board scientific payload. Calibration has become since then a fundamental component of my daily work as an experimental astrophysicist, also as Chair of the IACHEC (International Consortium for High-Energy Calibration). This is a collaborative forum of scientists involved in the calibration of space instrumentation who aim at collectively improving the consistency and reproducibility of the experimental results in our field. This consortium is still working on refining the calibration of "old" missions such as Chandra and XMM-Newton demonstrating how crucial is for our community to learn from the calibration experience of past observatories to be able to extract the whole science potential from the future Athena data.

However, what mostly shaped my view of the future of our field has been working – too shortly, regrettably - in the Hitomi Science Operation Team at ISAS. The first quick-look micro-calorimeter spectra of the Persues Cluster (see A.Fabian's contribution in this Newsletter) shocked us with the realization that the veil preventing scientists from exploring a hitherto unknown parameter space in plasma diagnostics had been ripped. This led me to accept enthusiastically the subsequent offer by ESA to join the Athena Study Team.

I started working on high-energy emission of accreting black holes 22 years ago, analyzing EXOSAT and ROSAT data of Galactic binaries and Active Galactic Nuclei. This field has made gigantic progress since. Still, we miss a full understanding of the detailed physics (dynamical, acceleration mechanism, covering fraction) of sub-relativistic winds launched in the innermost regions of the accretion disk; we know comparatively little on the population of heavily obscured AGN at the peak of black hole activity and beyond; and we have only started to get spectral-timing observational constraints on the geometry of the innermost corona down to scales of a few gravitational radii from the event horizon. In all these fields Athena will be a game changer.

I am happy, and proud for the opportunity of contributing to this change.

Athena Phase A Progress

Athena is the X-ray observatory selected by ESA to be the second L-class mission of the Cosmic Vision 2015-2035 programme, and due for launch in 2028

K. Nandra (MPE) and D. Barret (IRAP), for the Athena Science Study Team

The Athena Mission Consolidation Review in May 2016 concluded that a six month design activity should be carried out to:

1) allow a design iteration of the X-IFU
2) agree on a Management scheme for the Athena Focal Plane Module (now known as the Science Instrument Module or SIM) with the Instrument teams
3) perform a design iteration of the SIM together with Instrument teams
4) perform a structural design iteration of the spacecraft based on the updated SIM design and potential optimisation options
5) review costs with the industrial prime contractors to reduce uncertainties
6) assess Ariane 6 performance and interfaces for Athena.

It was recommended to have a Delta-MCR at completion of the above activities, which has just kicked off at the time of writing. It is expected that the outcome of the delta-MCR will enable the instrument AO to be released in January 2017.

With the support of the two instrument teams and the primes, ESA performed a Concurrent Design Facility (CDF) study of the SIM in October/November. As an input to this CDF run, the X-IFU team had performed a major redesign of the instrument to make it fit within its mass budget allocation, while preserving its top-level performance parameters. The above work has thus led to a baseline design of an SIM accommodating the two instruments and their thermal control systems, as well as ancilliary equipment, such as the instrument magnetic diverters.

The SIM design has undergone further refinement since the end of the CDF run and has been released to the industrial primes who are performing the spacecraft Phase A studies, to fold into their overall designs. The current designs indicate that there is still a marginal (~5%) non-compliance of the mass with the Ariane 64 lift capability to L2, which has been set conservatively to 7 tons. There are still a number of areas in which mass optimizations and/or reductions could be found at spacecraft level (e.g. the fixed metering structure, the mirror support structure, the SIM, propellant, mirror thermal control system etc.) and this will be the subject of further study and progress through Phase A.

The ASST has recommended with the highest priority to preserve the mirror effective area, and as a last resort to consider reduction of resources allocated to the overall payload. Optimizing the payload resources with respect to the mass may still be needed when all spacecraft related savings have been investigated and analyzing this will require the involvement of the Athena community working groups and topical panels, under the coordination of the ASST.

In addition to the technical issues, the MCR identified a number of areas in which costs could be saved, to ensure that the mission stays within the ESA cost-at-completion limit. These include: the mirror procurement scheme, international contributions at spacecraft level, international provision of the elements of the X-IFU cooling chain currently assigned to ESA, transfer of responsibility of the SIM (or part thereof) to the payload teams, and community provision of certain aspects of the scientific ground segment. Active discussions have been ongoing on all of these topics with considerable progress being made over the last 6 months. We expect that the dMCR will summarise the status of these discussions and the likely affordability of the mission looking forward to the end of Phase A.

An important development during the MCR process has been the discussion of responsibilities for the calibration of the Athena telescope. These are still ongoing, but it is hoped that this is an area where the scientific community can make a substantial contribution.

Technology developments also continue on the Athena optics. These are making good progress, with the Athena Silicon Pore Optics (SPO) achieving a resolution of approximately 7" Half Energy Width (HEW) over a large fraction (~50%) of the illuminated area of the mirror modules. The

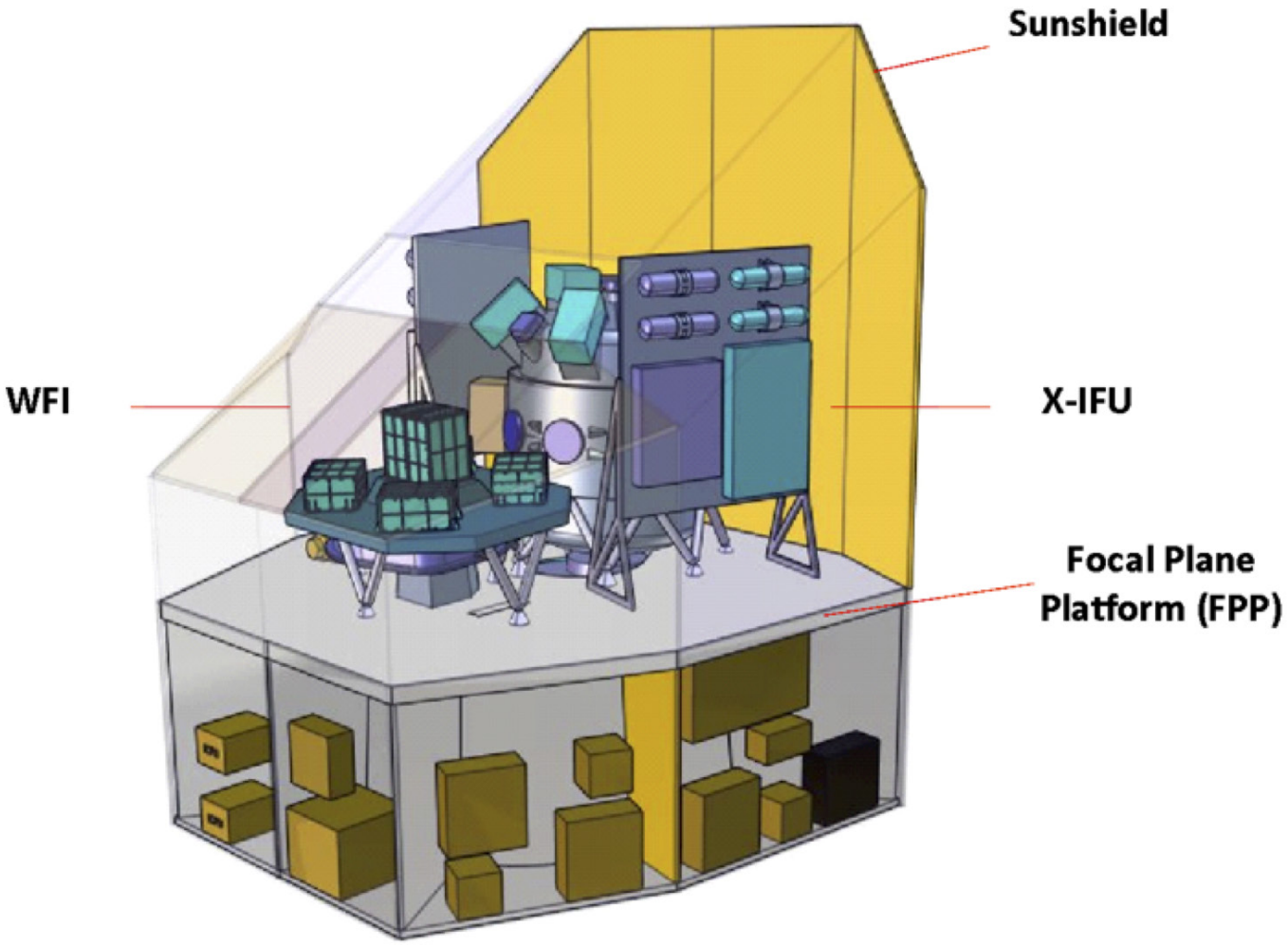


Figure 1: Conceptual design of the Athena Science Instrument Module (SIM), generated from the ESA Concurrent Design Facility (CDF) study undertaken in October/November.

next steps are to perform further analysis and refinement of the SPO stacking process to address the degradation of the performance at the mirror module edges, and to bring the overall angular resolution down to the required 5" HEW at system level. Additional activities include increasing the production rate and performing environmental qualification. Work also continues on key technology development for the instruments.

In parallel to the above activities, a draft science management plan (SMP) has been iterated and agreed between ESA, the payload teams and the lead funding agencies of the ESA member states. A draft SMP is a prerequisite for the release of the instrument AO, but is not finalized until mission adoption. The draft covers various items such as the overall organization of Athena in the coming phases and the definition and quantification of various observing time categories (Guest Observer, Guaranteed time, etc.). The SMP also introduces the concept of Key Programs designed to address major Athena science topics requiring large time investments.

A meeting of the Athena working group and topical panel chairs is scheduled at SRON on 21st-22nd of February and the *X-ray Universe 2017* (6th-9th June 2017) conference will hold a special session on Athena. These meetings will be the next opportunity to brief the community on the status of the mission as it progresses through phase A.

More information from ESA about the Athena mission and timeline is available at the ESA website.

The Hitomi X-ray spectrum of the core of the Perseus cluster: an aperitif for Athena

A.C. Fabian , Institute of Astronomy, University of Cambridge (United Kingdom)

The ill-fated Hitomi satellite took its first and only, deep, high resolution, X-ray spectrum early this year. Its X-ray calorimeter, operating at 50 mK, observed the central part of the Perseus cluster of galaxies for a total exposure of about 3 days. The target is X-ray bright due to its hot, 50 million K, intracluster medium composed of metal-enriched gas lying between the galaxies and peaking around its central massive galaxy NGC1275. The main goal of the observation was to determine the level of turbulent velocities in the gas revealed by Doppler broadening of strong X-ray emission lines due to highly ionized iron in the hot gas. This was spectacularly successful and yielded a result of 164±10 km/s for the velocity of turbulent motions in the outermost gas. The instrument worked as well as when it was in the lab. It was remarkably stable and demonstrated the enormous scientific potential for spaceborne X-ray calorimeters such as the X-IFU planned for flight on Athena. Unfortunately, Hitomi was lost a few weeks later before making any further significant observations.

The measurement achieved by Hitomi is important in revealing that the level of turbulence in a cluster core is relatively low, representing an energy density and pressure of only 4 per cent of thermal values there. This is encouraging for cluster cosmology studies, that assume that clusters evolve throughout cosmic time as closed systems, since it suggests that they will not be seriously disturbed by the effects of turbulence. It also provides a strong constraint on the manner in which mechanical energy supplied to the intracluster gas by the powerfully jetted active nucleus of NGC1275 is propagated throughout the cluster core. The energy radiated from the gas in X-rays is too large for turbulence alone to be responsible. One possibility is that sound waves transport the energy.

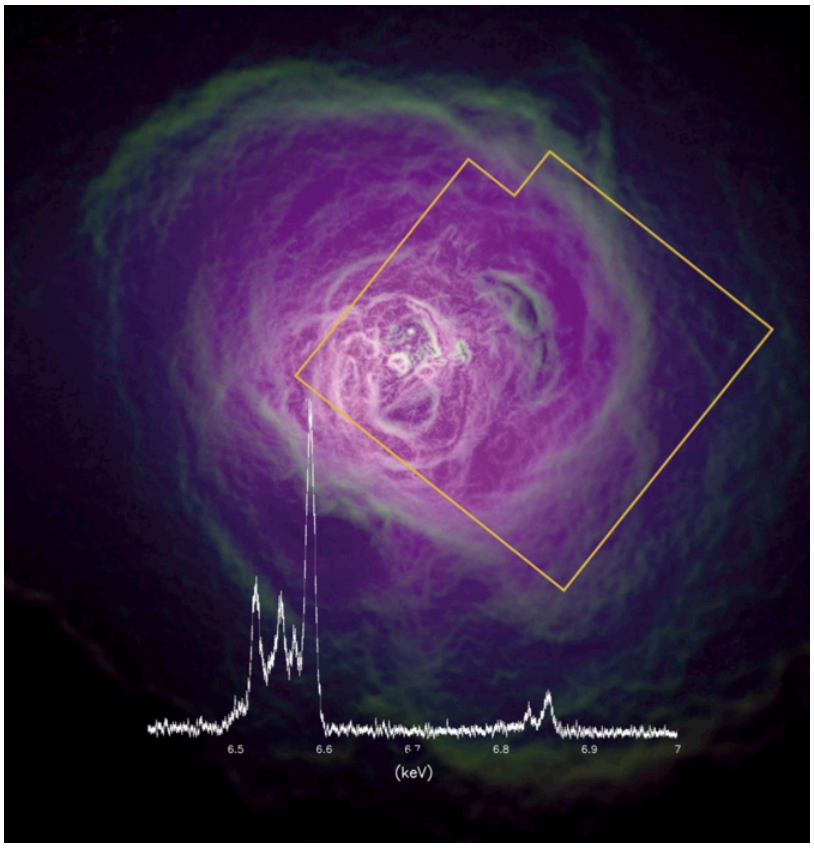


Figure 2: The Hitomi SXS spectrum of highly-ionized iron ions is superimposed on an enhanced Chandra X-ray image of the Perseus cluster core. The nucleus of NGC1275 is at the centre. The yellow clipped square shows the field of view of the 35 pixel SXS. Credit: A.C. Fabian and Hitomi Collaboration.

Such beautiful data gave us only a taste of the exciting perspective enabled by high X-ray spectral resolution. This new observing window has been briefly opened but is now again firmly shut. But with the spectral resolution of the Athena X-IFU, twice that of Hitomi, its two orders of magnitude larger number of imaging pixels, the vastly greater collecting area of the telescope and the spatial resolution an order of magnitude better, the astronomical community will be served a full course of the hot and energetic Universe. There will be so much to see and do when it is launched!

The Athena X-ray Telescope Mirror by Numbers

R. Willingale, Dept. of Physics and Astronomy, University of Leicester (United Kingdom)

The Athena Mission will incorporate the largest X-ray primary mirror ever built, with an aperture diameter of 3 m, a mirror component mass of ~300 kg and total mass including support structure of ~650 kg. The Wolter I grazing incidence (1) reflection geometry is used to produce a true image of the X-ray sky in the energy band 0.1-15 keV. The effective area at 1 keV is 2 m^2, a factor of ~14 larger than the largest extant Wolter I mirror modules used on ESA's XMM-Newton X-ray space observatory. The angular resolution is 5 arc seconds (Half Energy Width), a factor of ~3 better than XMM, over a field of view of 40 arc minutes in diameter. This impressive performance is made possible by an innovative new X-ray technology, Silicon Pore Optics (SPO). The SPO mirrors are made using commercially available 12-inch Si wafers. The wafers are diced and grooved to produce Si mirror plates, each typically 100x40 mm^2. 35 plates are accurately cold-welded together to form stacks (2) with an aperture split into ~1500 rectangular pores where each pore (3) has an aperture 0.605x2.3 mm^2. Two stacks are precisely aligned to produce an X-ray optical unit (XOU) which behaves as an X-ray lenslet. X-rays are focused by 2 grazing incidence reflections (1), 1 in the front stack (4.1) and 1 in the rear stack (4.2). Two XOUs are integrated together to produce an Athena Mirror Module (MM) (4) and finally, ~1100 MMs are mounted and co-aligned to populate the mirror aperture (5). A total of ~150,000 Si plates are required to construct the full mirror. The area of super-polished X-ray mirror reflecting surface is 400 m^2, sufficient to completely cover 2 tennis courts. Because of the SPO construction the aperture is divided into ~2.6 million pores.

Production of the mirror is a formidable task of optical engineering. The SPO stacks are to be made by a fully automated robotic process and 3 assembly robots working for 3 years will be required to produce the full complement of MMs. The stacks in the MM are aligned using an X-ray synchrotron beam. All individual MMs must be tested and calibrated in X-rays to measure the point response function and collecting area as a function of X-ray energy. The fully integrated mirror must also be tested and calibrated on the ground using a long X-ray beam facility with length greater than 500 m, a beam diameter of at least 3 m and a vacuum tank large enough to accommodate the mirror and an X-ray imaging detector at the focal distance of 12 m.

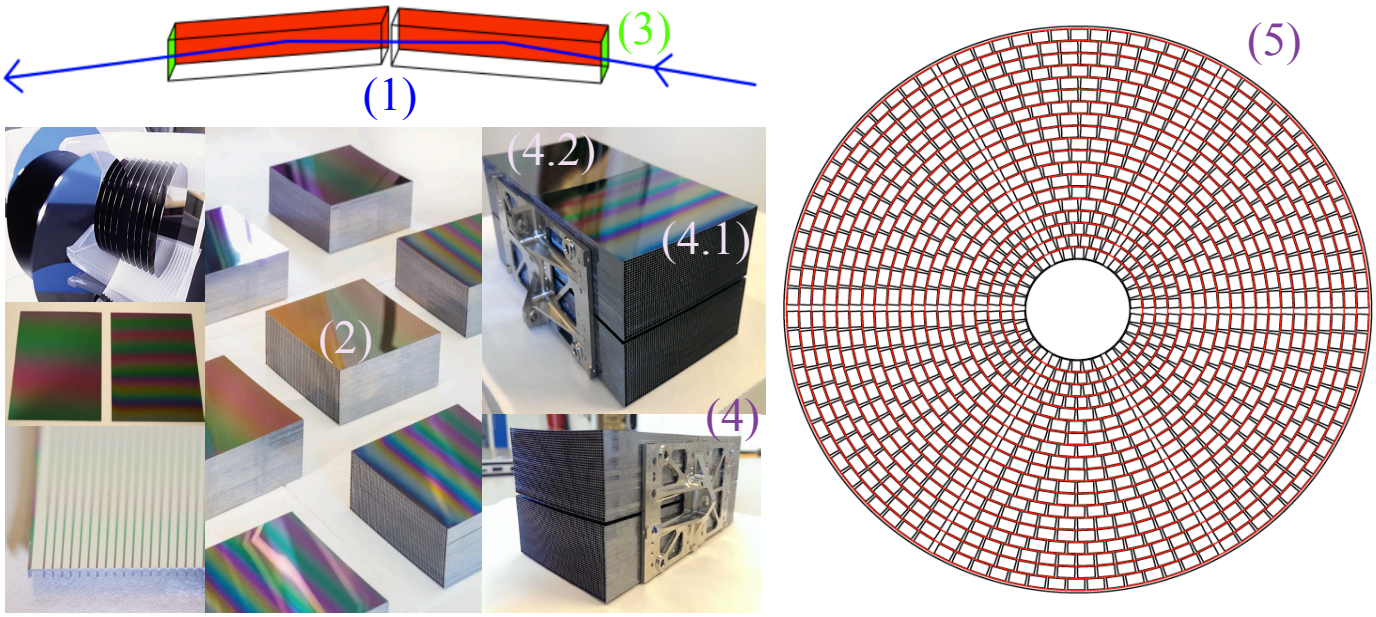


Figure 3: Left: the production of a Mirror Module: ribbed wafers are stacked in an SPO module and 4 are combined in two pairs to form a Mirror Module. Right: front view of the Mirror Assembly Module showing the > 1000 MM required to reach the 2m^2 effective area at 1 keV.

News from the Instruments

News from the WFI

A. Rau (WFI Project Scientist) and K. Nandra (WFI Principal Investigator)

Work continues on the development of the WFI conceptual design and technology development, with excellent progress being made. An important step was reached in early autumn 2016 with the completion of the fabrication of the first WFI-specific prototype DEPFET sensors at the Semiconductor Laboratory of the Max Planck Society. This has yielded a variety of DEPFET sensors with different transistor designs, technologies and matrix formats. Over the coming months the sensors will undergo detailed testing with the goal to identify the best sensor types for the next fabrication run, which will include full-size matrices. Work also continues on the breadboard model of the WFI signal processing chain, which will incorporate the current prototype sensors. This model will be used to demonstrate a technology readiness level (TRL) of 5, which is required prior to the adoption of the mission in 2020.

At the SPIE meeting on Astronomical Telescopes and Instrumentation in Edinburgh in June, several members of the WFI team presented the status of the instrument to the wider community. The instrument presentations included the camera head, detector electronics and filter wheel subsystems. Copies of the relevant papers can be found at the WFI website.

Several new partner nations have been admitted into the WFI proto-consortium since the last newsletter. The US (in a consortium led by Penn State) will provide the primary structure and support for the Front-End electronics development. In addition, they will perform a study for a science products module, which is intended to enhance the scientific performance of the WFI through on-board data analysis. Switzerland (University of Geneva), Greece (lead by National Observatory of Athens) and Portugal (University of Lisbon) have joined the consortium to participate in the WFI science ground segment activities. Portugal will also contribute to the hardware and ground support equipment.

News from X-IFU

D. Barret IRAP, X-IFU Principal Investigator and T. Lam Trong, CNES, X-IFU Project Manager

The X-IFU Consortium has been working on the recommendations of the Mission Consolidation Review (MCR). The X-IFU underwent a design-to-mass exercise to make it fit within the budget allocation. This led to a redesign of the cryogenic chain and modification of the thermo-mechanical configuration of the Dewar. The overall electrical architecture of the X-IFU has also been reviewed. The new baseline was considered by ESA for the concurrent design facility run on the Focal Plane Module (FPM) that took place in October 2016.

In parallel, extensive discussions took place between ESA, the WFI and the X-IFU teams on transferring some FPM activities to the payload teams; the outcome of which is being reviewed as part of the delta MCR.

Following a recommendation from the X-IFU Science Advisory Team (XSAT) and the X-IFU system team, the X-IFU Consortium Management Team decided to change the baseline configuration of the TES array towards a (twice) slower pixel configuration. The count rate requirements applying to the X-IFU are met (and even exceeded) by defocussing the mirror. At system level, slower pixels mean relaxation of requirements on some key components of the readout chain, and thus providing additional feasibility margins overall.

The XSAT keeps analyzing some of the most driving science requirements, such as bright source count rate capabilities including filters, the angular resolution, the background reproducibility, the detection of absorption features from the Warm Hot Intergalactic Medium.

An X-IFU Calibration team (François Pajot, lead) has been appointed with the goal to draft the X-IFU calibration plan by early 2017. Similarly discussions about the organization of the X-IFU Instrument Science Center (Natalie Webb, lead) and share of responsibilities within partners of the consortium are about to start.

The first X-IFU Progress meeting was held in CNES on 24th-25th November. It gathered together with the CNES project team, all the project managers of sub-systems, all across the X-IFU consortium. They got updated on the instrument and system status, and provided feedback on their activities.

The X-IFU Consortium is getting ready for responding to the instrument AO anticipated early 2017.

The X-IFU consortium is led by France (IRAP & CNES), Netherlands (SRON), Italy (IAPS), and involves six other member states (Belgium, Finland, Germany, Poland, Spain, Switzerland) and two international partners (USA and Japan).

You are welcome to visit our Twitter.

SKA-Athena synergy exercise: status report

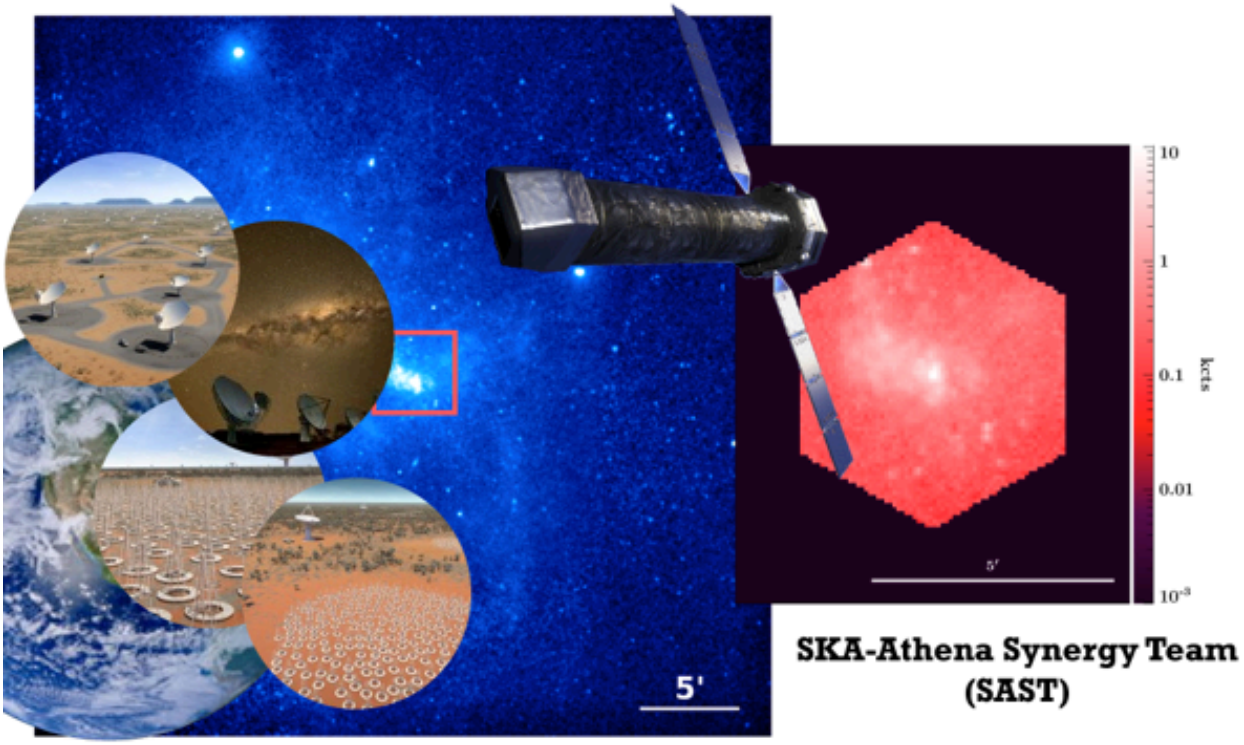
Synergies between Athena and SKA under exploration by the SKA-Athena Synergy Team

R. Cassano (INAF/IRA, SAST chair), X. Barcons (ASST), R. Braun (SKA Science Director) and S. Martínez-Núñez (ACO)

The Athena Science Study Team (ASST) and the SKA Observatory have agreed to undertake an exercise to identify and develop potential synergies between both large observatories. The Athena and SKA science objectives have areas in common, and combining data from the two facilities will result in a very exciting scientific added value. Anticipated themes where strong potential synergies have been preliminarily identified include galaxy clusters, AGN feedback, obscured AGN and transient phenomena.

A SKA-Athena Synergy Team (SAST) has been appointed to explore and develop all foreseeable scientific synergies and, together with community experts, will produce the SKA-Athena Synergy White Paper. Four international experts, covering the relevant scientific areas and both wavelength domains, conform the SAST: Rossella Cassano (INAF/IRA, Chair), Chiara Ferrari (OCA), Rob Fender (Oxford) and Andrea Merloni (MPE). The Athena Community Office is assisting in this exercise and it is the main interface between the SAST and the Athena activities. Support by the SKA Organisation, MPE and ESA is being provided.

The SAST kicked-off its activities on 27th September 2016 by identifying a draft list of synergy themes. The next step will be an SKA-Athena Synergy Workshop hosted by the SKA Observatory at Jodrell Bank in Manchester on 24th and 25th April 2017, with the objective of providing input for the White Paper to be prepared by the SAST. An open call to the community inviting expressions of interest to contribute to this Workshop was issued on 2nd November 2016 with a deadline of 30th November 2016. The scientific community has positively responded to this call. The contributions are under evaluation by the SAST and they expect to produce invitations to the Synergy Workshop before the end of 2016. Armed with the contributions from the community at this Workshop, the SAST will prepare the SKA-Athena Synergy White Paper, to be delivered to ESA's ASST and the SKA Observatory around September 2017 and subsequently made public.



Athena Community People

Françoise Combes

I am an astrophysicist at Paris Observatory, and professor at College de France. I have worked both on numerical simulations of galaxy dynamics and multi-wavelength observations of galaxies, at low and high redshift. X-ray data have always been very useful to me, first for the physics of AGN, where my interests are in their molecular gas fueling and feedback, and second to map the hot gas in cool core galaxy clusters, where we have detected molecular gas in cooling filaments.

I am co-chairing the topical panel "Multi-wavelength synergy", which is gathering all common interests from radio wavelengths to gamma-rays for the Athena science. I participate in the EAST (ESO-Athena Synergy Team) writing the White Paper on Athena synergies with ESO based facilities in the Optical/NIR (VLT, E-ELT) and sub/mm (ALMA) regimes.

francoise.combes@obspm.fr

Peter Jonker

I am an astronomer working at SRON in the Netherlands. My research group is funded largely through an ERC Consolidator grant. The main aim is to determine black hole masses in a dynamical way. In particular we are trying to find out if intermediate-mass black holes exist.

I am co-chairing the Athena Topical Panel on Luminous Extra-Galactic transients and I am a member of the X-IFU science advisory team. I am also a member of the ESO-Athena Synergy team, which is in the process of identifying science goals for Athena and ESO facilities that would benefit or can only be achieved using both Athena and ESO data. In the Netherlands, I am coordinating with the different university teams which activities are necessary such that we can maximize the science harvesting of Athena.

One of my hopes is that the Athena WFI will offer the capability to alert astronomers in (near) real time on any transient that is serendipitously found in its field of view.

p.jonker@sron.nl

Hironori Matsumoto

I am a high-energy astrophysicist at Kobayashi-Maskawa Institute, Nagoya University, Japan. I started my career by studying X-ray emissions from early-type galaxies and clusters of galaxies using the ASCA satellite. Then I discovered the X-ray source M82 X-1 with Chandra and started to study ultra-luminous X-ray sources. Now I'm interested in X-ray emissions from the central region of the Milky Way Galaxy, especially the follow-up X-ray observations of unidentified TeV gamma-ray sources, so-called "dark accelerators." Besides these X-ray observations, I have been heavily involved in the development of X-ray instruments. I participated in the development of the X-ray CCD (X-ray Imaging Spectrometer; XIS) on board the Suzaku satellite, and then I developed the Hard X-ray Telescope (HXT) on board the Hitomi satellite as a deputy leader of the HXT team.

I am a chair of the ISAS Athena working group, and a member of the Athena Science Study Team on behalf of ISAS/JAXA. I am co-chairing of the SWG3, Observatory science of Athena.

matumoto@u.phys.nagoya-u.ac.jp

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

Dear Colleague,

The mandate established by ESA to the Athena Science Study Team (ASST) includes serving "… as focus for the involvement of the broad scientific community" in Athena. In order to fulfil this duty, and to gain the needed support for the studies and development of the Athena mission, the ASST has established a structure of Working Groups (WG) and Topical Panels (TP), which has been populated via two open calls to the community. The Athena Community currently consists of more than 800 researchers from around the world participating in these WG/TPs. Full information about the terms of reference, structure and membership of the WG/TPs can be found at The Athena X-ray Observatory: Community Support Portal.

In order to offer new opportunities to join the Athena Community, a yearly call to serve in the WG/TPs will be issued. Applications are open to all researchers with appropriate background and strong interest in scientific and technical matters related to the Athena mission, specially –but not only- to early career researchers.

Applications will be internally assessed by the ASST, with the help from the WG/TP chairs. Successful applicants will be appointed as members of a particular WG/TP.

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

We expect applicants to apply for membership of one single WG/TP. In exceptional circumstances, membership of two panels could be considered, but in this case a strong justification needs to be provided.

The deadline for applications is 31st January 2017, 14:00 CET. The expectation is that appointments to successful applicants will be issued within Q1 2017. Should you have any questions about this call, please contact the Athena Community Office at aco@ifca.unican.es

Thanks for your support

Athena Science Study Team

Athena in Conferences (January-mid July 2017)

■ 229th American Astronomical Society meeting, Grapevine (United States), 3rd-7th January 2017: splinter session about Athena coordinated by Randall Smith. Visit the conference website for more details.

■ IAU Symposium 331 - SN 1987A 30 years later: Cosmic Rays and Nuclei from Supernovae and their aftermaths, La Réunion Island (France), 20th-24th February 2017: session on "Future facilities & perspectives (Advanced LIGO/Virgo, KM3NeT, IceCube-Gen2, SKA, LSST, Athena, MeV, CTA)"

■ SKA-Athena Synergy Workshop, hosted by the SKA Observatory at Jodrell Bank, Manchester (United Kingdom), 24th-25th April 2017. Participation is by invitation only, following an open call.

■ The X-ray Universe 2017, Rome (Italy), 6th-9th June 2017: a special session on Athena is being organised in that conference. Visit the conference website for more details.

■ European Week of Astronomy and Space Science, Prague (Czech Republic), 26th-30th June 2017: Session S15 - Scientific synergies enabled by SKA, CTA and Athena. Scientific Organising Committee: R. Braun, A. Possenti, E. de Oña-Wilhemi and X. Barcons. Visit the conference website for more details.

■ Whereabout and Physics of the Roaming Baryons in the Universe, Sesto Val Pusteria (Italy), 10th-14th July 2017, sponsored by AHEAD. Visit the conference website for more details.

AAS AMERICAN ASTRONOMICAL SOCIETY
Enhancing and sharing humanity's scientific understanding of the universe since 1899.

Agenda, Athena Splinter Meeting, Thursday Jan 5, 2017, 229th AAS

NASA Report:

■ 2:00 pm - Garcia: Athena Status, NASA Actions and Plans (10 min + 5 Q/A)

Instrument Team Reports:

■ 2:15 pm – Barret: The Athena X-ray Integral Field Unit (X-IFU) (15 min + 5 Q/A)
■ 2:35 pm – Bandler: NASA contribution to X-IFU (15 min + 5 Q/A)
■ 2:55 pm – Burrows: NASA contribution to WFI (15 min + 5 Q/A)

Discussion:

■ 3:15 pm - Open Discussion, starting with US Data Center needs and S/W
Starting with single slides from: Donahue, Bregman, Ballantyne, Griffiths, Plucinsky
■ 4:00 pm – Adjourn