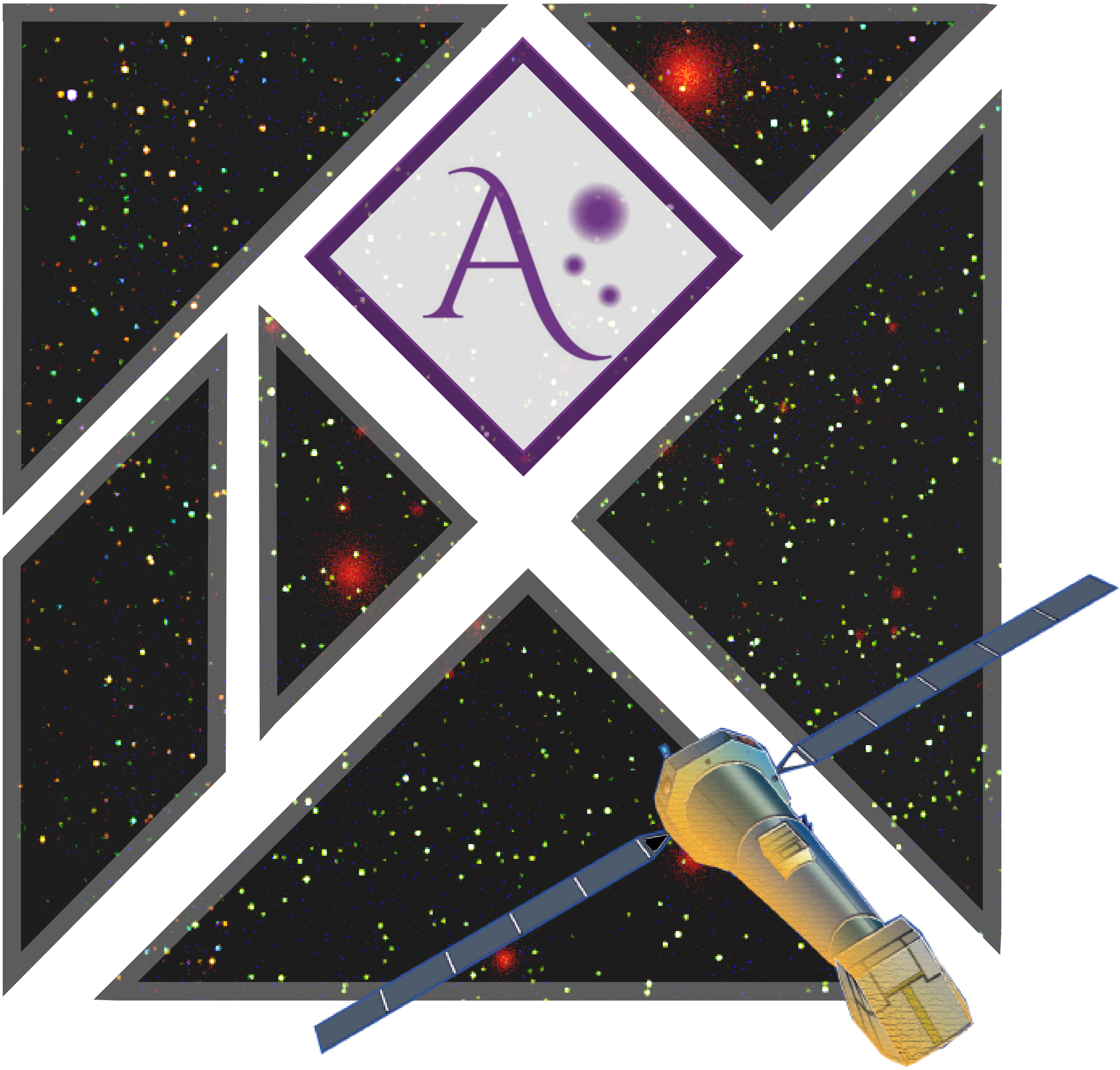


ATHENA COMMUNITY NEWSLETTER #4

December 2017

ATHENA

Contents

Edited by *Athena* Community Office:
F.J. Carrera, M.T. Ceballos, S. Martínez-Núñez, M.P. Monterde
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
@athena2028
The Athena X-ray Observatory
Athena X-ray Observatory

*Front cover image credit: SIXTE simulation of a single 100ks *Athena*/WFI pointing of the Chandra Deep Field South. Galaxy groups and clusters, visible as extended red (i.e. soft) sources have been added. Composition: ACO Team.

Welcome

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

This issue sees a number of special features in addition to the usual updates on the progress of the Phase A study, and the development of the instruments.

A big stir in the astronomy world was created recently by the detection of gravitational waves of a neutron star-neutron star merger. The so-called kilonova that resulted was also seen in electromagnetic radiation as a gamma-ray burst and its associated afterglow, opening up a new window for multi-messenger astronomy. A special exercise looking at multi-messenger synergies is planned for the future, but for now you can find a report on the latest synergy exercise which has been undertaken with SKA under the leadership of Rossella Cassano and the SKA-*Athena* Synergy Team.

If you are interested in simulating *Athena* data, you will find out how from a dedicated article on the subject lead by Joern Wilms, and our science highlight this edition focusses on high redshift galaxy groups and clusters from Steve Allen and Adam Mantz.

Finally, three *Athena* scientists Eleonora Troja, Axel Schwope and Graziella Branduardi-Raymont have been brave enough to put themselves in the spotlight. We hope you enjoy reading their stories, along with the rest of the newsletter.

As the New Year approaches, it is time once again for us to open up applications for the *Athena* Topical Panels. If you are reading this newsletter and are not already a member of the *Athena* team, or have colleagues who may be interested in contributing to the project, we would love to hear from you.

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

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 the 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 here.

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 following 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 31 January 2018, 14:00 CET. The expectation is that appointments to successful applicants will be issued within Q1 2018.

Should you have any questions about this call, please contact the *Athena* Community Office.

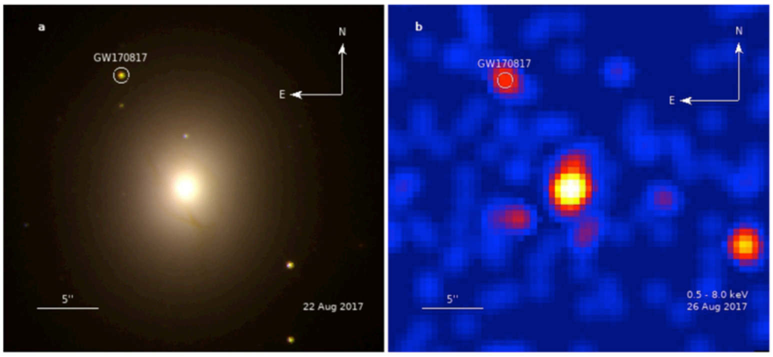
Thanks for your support,

Athena Science Study Team

Discovery of Electromagnetic Counterparts to Gravitational Waves

Luigi Piro (IAPS/INAF, Rome) and Eleonora Troja (University of Maryland & NASA/GSFC)

On August 17 2017, gravitational waves (GW) and photons produced by a neutron star (NS) merger were discovered. For the first time, astronomers witnessed the wealth of information that can be derived by combining together GW and electromagnetic (EM) observations. While the GW signal traces the spiral-in and the merger of the NSs, EM observations follow the subsequent explosion and the evolution of its remnant. The optical and infrared counterpart, visible just for a few days, is powered by the radioactive decay from freshly synthesized r-process material in the merger ejecta, known as kilonova. It is now argued that this could be the main source of elements heavier than iron in our Universe. The newly discovered X-ray counterpart (Troja et al., 2017, Nature, 551, 71) and, later, the radio counterpart, exhibit for the first time the long-sought-after behavior of a Gamma-Ray Burst (GRB) whose jet is pointing away from the Earth, consistently explaining also the weak luminosity of the gamma-ray signal detected 1.7 seconds after the GW event. The discovery of GW170817 and its X-ray counterpart demonstrates unquestionably that NS mergers form relativistic jets powering GRBs of short (< 2 s) duration. Astronomers are now ready to observe this source as soon as it comes back to visibility in December. The long term behavior of the X-ray and radio afterglow will tell us much about the relativistic outflow. On a longer timescale, the second generation of GW interferometers will uncover a new population of weak and likely off-axis GRBs associated with NS mergers, thus providing an unprecedented opportunity to investigate the properties of these cosmic explosions and their progenitors. We expect that *Chandra* and XMM* could detect such X-ray afterglows if the GRB jet is, as for GW170817, not too far from our line of sight but only *Athena* will enable us to reach out the full population.



a) Hubble Space Telescope image shows a bright and red optical transient, in the early-type galaxy NGC 4993. b) *Chandra* observations revealed a faint X-ray source at the position of the optical/infrared transient. X-ray emission from the galaxy nucleus is also visible (from Troja et al. 2017).

* XMM could not observe GW170817 because the source was outside its field of regard

Athena Project Status

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

Athena continues to progress through its Phase A study, with a detailed examination of the technical and programmatic issues. The next six months are expected to see a consolidation of this process, combining results from the ESA study team, the two industrial Prime contractors and the X-IFU and WFI instrument teams. The Phase A plan has recently been reformulated by the ESA study team, with a number of milestones and reviews over the coming year. The goal is to complete the Phase A with a formal review (currently designated the Mission Formulation Review or MFR) at the end of 2018, with the aim to define a baseline that meets the cost, mass, and schedule constraints.

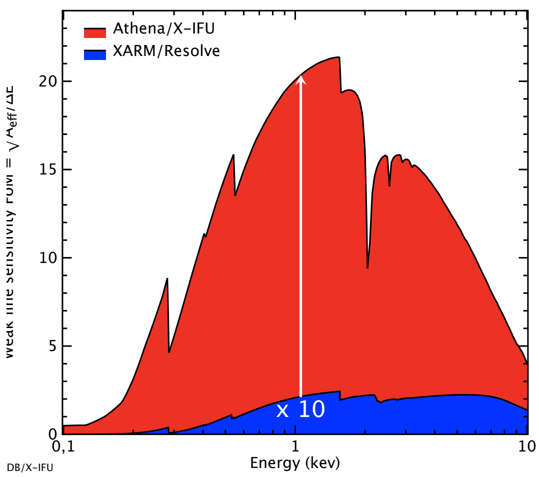
As indicated in the last newsletter an issue still to be fully resolved is the mission cost to ESA. The Phase A cost estimate of the mission as-proposed exceeds the cap of €1.05bn specified by the ESA Science Program committee (SPC) at the time *Athena* was selected. A major design-to-cost exercise has therefore been initiated along with parallel efforts to identify cost-mitigation options and efficiency savings. The philosophy behind this has been to define a mission with the best science performance while meeting the imposed programmatic constraints. The scientific community was fully involved in this via an activity entitled CORE (the Cost-driven Observation Reprogramming Exercise) which was set up to assess the science performance of a mission configuration expected to be within cost. The ESA *Athena* study team proposed a number of options for this cost-constrained mission configuration. While some of these should have no impact on science, others which do were considered during CORE. These included the removal of 5 of the 20 mirror rows (with a corresponding reduction in the effective area), a reduction in the field-of-regard (saving hardware costs e.g. for the deployable sunshield and solar array drive mechanism), and reductions in operational costs (e.g. via a shorter mission lifetime and reduced ground system support for ToOs).

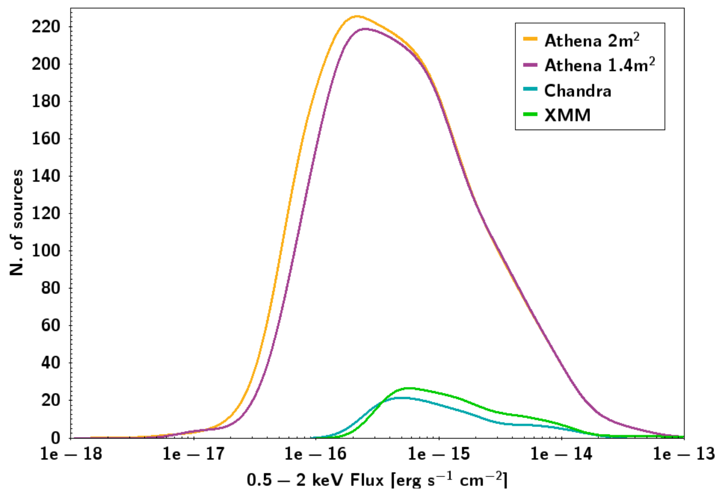
The ASST and its working groups assessed the performance of the resulting cost-constrained mission, and assembled a revised mock observing program indicative of how the existing science objectives might be addressed in the revised mission configuration. The ASST concluded that this cost-constrained mission still represents a major breakthrough in capabilities. The resulting mock observing program retains the breadth of the *Athena* science addressing the vast majority of the specific Hot and Energetic Universe science objectives. The main negatively affected cases were those relying on the field of regard and fast ToO response, and the ASST recommended that all steps be taken to retain those capabilities. In considering the possible reduction of effective area, the ASST concluded that preserving the high energy of the mirror was a priority and if deemed necessary to fit *Athena* within the cost cap, reducing the 1 keV effective area by removing outer mirror rows would be preferred. The ASST stated however that maximizing the 1 keV response remained a high priority. A reduction in nominal mission lifetime from 5 to 4 years was furthermore deemed acceptable.

A number of figures of merit demonstrating the science capabilities of the cost-constrained mission were constructed (See below) to compare *Athena* to current and approved future missions. These were included in a presentation by the *Athena* Study Scientist Matteo Guainazzi to the ESA Advisory Structure in their meeting in October.

A thorough analysis of the *Athena* mission costs and more generally the Phase A work by the Primes is being performed as part of a status review by ESA, which is currently in progress. Following this there will be a short "delta" industrial study to assess the implications of the reduced mirror configuration, ending in a further review in mid-2018 to define the baseline mission. A Preliminary Requirements Review of the instruments is expected in Q3/Q4 of 2018. Assuming the success of these various reviews the mission is expected to proceed to the MFR at the end of 2018.

As well as providing scientific support for the ongoing Phase A work, the ASST have been asked by the ESA study team to consider the science impact if certain performance parameters of the mission are not fully demonstrated by the time of MFR or mission adoption. Actions are therefore being planned to assess the sensitivity of the *Athena* science objectives to key performance parameters. This will provide important input to the MFR and subsequent consideration of risk mitigation with respect to several *Athena* technology development activities.





Figures of merit illustrating the scientific potential of *Athena*. Left: weak line sensitivity versus energy comparing the *Athena*/X-IFU to XARM/Resolve (the *Hitomi* recovery mission). An improvement of a factor 10 is seen at 1 keV for the cost-constrained mirror, opening the high redshift Universe to high resolution X-ray spectroscopy. Right: survey capability for the *Athena* WFI versus *Chandra*/XMM-*Newton*, as measured by the number of detected sources per FoV versus flux in a 100ks exposure. A dramatic improvement in the ability to detect very faint sources such as high redshift AGN is seen for both the as-proposed (2m^2) and cost-constrained (1.4m^2) configurations.

News from the Instruments

News from the WFI

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

In the current project phase, work within the Wide Field Imager (WFI) consortium focuses on the development of the instrument's conceptual design and on technology developments.

The 6th meeting of the WFI Consortium was held from October 10th to 12th in the Nicolaus Copernicus Astronomical Center (CAMK) Warsaw, Poland. More than 70 consortium members attended to discuss the status of the instrument development, scientific activities, and plans for future work. During two days of lively discussion, excellent progress for all relevant instrument subsystems was demonstrated.

The development of the DEPFET sensors is making excellent progress with the successful test of prototype detectors, and the production of the proto-flight sensors has started. First vibration test of the supporting mesh for the large optical/UV light-blocking filters were also successful and the next tests with flight-like filters are in preparation. All other subsystems, e.g., electronics, filter wheel, thermal, and mechanical are progressing well.

The WFI Science Team has been reviewing the latest updates to the science requirements and the ongoing science assessment activities. The background Working Group is making progress on the reduction and understanding of the instrumental background while the SIXTE end-to-end simulator has been recently updated.

News from X-IFU

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

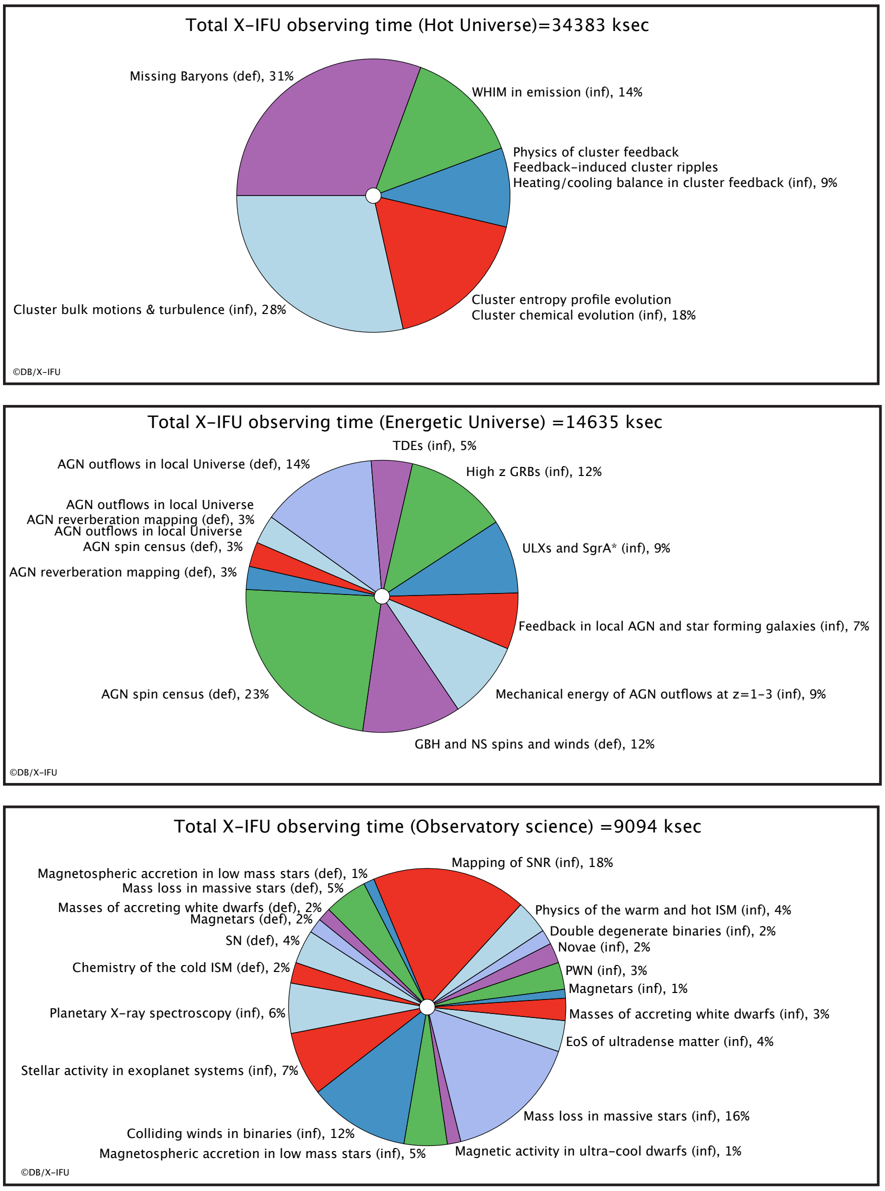
Since the last issue of the *Athena* Newsletter, the *Athena* Science Study Team initiated together with the ESA study team, the so-called CORE exercise (Cost-Oriented Reprogramming Exercise). To fit a coherent science program, preserving the core of the *Athena* science, within the constraints of a reduced 1 keV effective area and a reduced mission lifetime (from 5 to 4 years), several science objectives are now sharing targets and observing times, so that one single observation can be used to address several core science goals. The increased count rate capability of the X-IFU, enabled by the defocussing of the optics was also fully taken into account in CORE, e.g. spins, winds and outflows of Galactic black hole and neutron star binaries are now using the X-IFU in its defocussed mode. As a result, the Mock observing program related to X-IFU has changed, strengthening some key X-IFU performance requirements, such as the instrument field of view or the throughput for bright sources. The figure below shows the current split of X-IFU observing time for the *Athena* core and observatory science goals, highlighting the sharing of X-IFU time and targets between different scientific objectives, as derived from CORE.

coolers to produce the 50 mK required by the instrument. Finally some of the key X-IFU performance budgets have been consolidated (e.g. spectral resolution, count rate capability, background, quantum efficiency).

The sixth X-IFU Consortium meeting took the shape of an X-IFU week and was hosted by CAB-INTA at the CSIC headquarters in Madrid in September. The next X-IFU week will be in Paris, hosted by the ApC institute, and will cover the week of March 19th, 2018. About 20 X-IFU related papers have been submitted to the SPIE 2018 conference.

Concerning the instrument itself, the prime focus has been on the cryogenic chain architecture, through a critical examination of the main design drivers: thermal loads, cooling powers, margin philosophy, mechanical design (straps and harness) and finally redundancy philosophy. The margin policy has been iterated between ESA and the X-IFU team, with emphasis on the uncertainties and margins to be taken at all temperature stages and at system level. A peer review on the X-IFU cryogenic chain was held in October involving international space cryogenics experts and external members of the X-IFU consortium. The review was concluded early December, by the definition of a work plan based on the recommendations received. This will lead to a consolidated cryogenic chain baseline by mid 2018, in time for holding the Preliminary Requirement Review of the X-IFU, currently planed towards the end of 2018. At project level, the phasing of the instrument schedule with the overall *Athena* schedule, including reviews and deliveries, is being optimized.

Along these activities, the avionics/electrical architecture has now reached a high level of maturity. Subsystem specifications are being issued and discussed. The demonstrator of the cooling system has also made considerable progress with the successful coupling of European and Japanese



The split of X-IFU observing time between the Hot Universe (top), Energetic Universe (middle) and Observatory science (bottom) scientific objectives of *Athena* after CORE. The numbers are derived from the Mock Observing Plan (v4): some numbers may be subject to small modifications. When more than one scientific objective is listed, this means that X-IFU observing time is shared between them. The observing mode for the X-IFU is indicated in parenthesis: *inf* means that the X-IFU is used in focus, while *def* means that it is used in defocussed mode.

The SKA-Athena Synergy Exercise Coming to the End

Rossella Cassano (INAF- Istituto di Radioastronomia, Bologna, Chair of SKA-Athena Synergy Team)

The *Athena* Science Study Team (ASST) and the Square Kilometre Array (SKA) Organisation agreed to undertake an exercise to identify and develop potential synergies between both large observatories. To this aim a SKA-*Athena* Synergy Team (SAST) made by four scientists expert in different science topics (R. Cassano, R. Fender, C. Ferrari and A. Merloni) was established to conduct this exercise in close coordination with experts in the astrophysical community.

The SAST's main task was to produce a Synergy White Paper to identify and develop the:

- Needs to access SKA or its precursors to achieve the formulated *Athena* science objectives

- Needs to access *Athena* to achieve the formulated science objectives of SKA

- Science areas where the synergetic use of *Athena* and SKA in the late 2020s will result in scientific added value.

The involvement of the astrophysical community in this process happened primarily through a SKA-*Athena* Synergy Workshop, that took place on April 24-25, 2017 at SKAO, Jodrell Bank, Manchester. The Workshop was extremely insightful and a number of synergy topics naturally arise from those scientific areas where combined radio X-ray studies are mandatory.

SKA-*Athena* synergy workshop, 24th-25th April 2017

The White Paper will represent the final product of the synergy exercise and will be authored by the SAST, while scientists mainly contributing to the work will appear as collaborators. The following main topics have been identified and discussed (more details and additional topics are mentioned in the White Paper, which it will be published at the beginning of 2018 in arXiv):

1. Galactic astronomy: the study of young stellar objects and ultracool dwarfs, star-planet magnetic interaction, massive stars, pulsars and supernovae remnants, that will allow a deeper understanding of the microphysics of interstellar shocks.
2. X-ray binaries, transients and black holes accretion physics: studies of jets and winds in Active Galactic Nuclei (AGN) and X-ray binaries will decipher the wind launching mechanisms and unravel the connection of winds with the state of the accretion disc and jet properties. Significant progress will be made in the knowledge of Tidal Disruption Events (TDE), which are important for the study of the quiescent supermassive black holes (BH) and BH mass function.
3. The SKA and *Athena* Surveys: they are key tools to understand the very high-z Universe (i.e., sources for the cosmic reionization) the pop III stars and their connection to long gamma ray burst and the AGN/star-formation relationship at different cosmic epochs, solving many important issues about the influence of BH growth on galaxy evolution.
4. AGN feedback in galaxy clusters: the capability of *Athena* to reconstruct the gas cooling curve in the cluster cores combined with the radio studies of the non-thermal cavity contents could really solve the puzzle of the cooling/heating balance in clusters cores.
5. Non-thermal phenomena in Galaxy Clusters: the measure of cluster turbulence with *Athena*/X-IFU combined with SKA observations of giant radio halos could prove the presence of turbulent acceleration mechanisms operating in the intracluster medium, while the study of shock structures in connection with radio relics could help to solve the issue of shock-acceleration in galaxy cluster shocks.
6. Detecting the Cosmic Web: the exciting possibility of detecting both thermal and non-thermal emission with *Athena* and SKA will allow us to better constrain the (yet unknown) plasma conditions at strong accretion shocks, in an hitherto poorly known environment.

Athena End-to-End Simulations

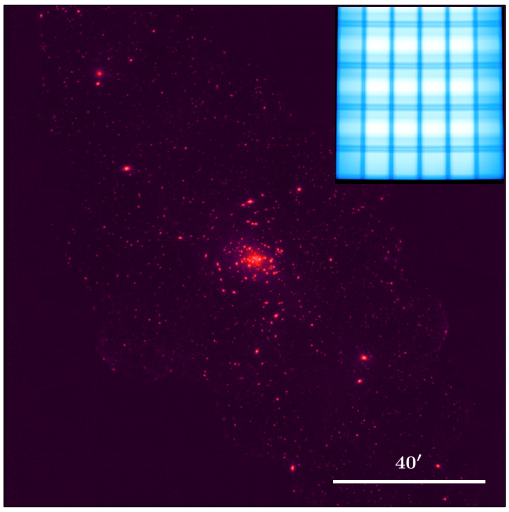
J. Wilms (ECAP), P. Peille (CNES), T. Dauser (ECAP) and E. Cucchetti (IRAP)

What will *Athena*'s scientific data look like? What is the performance of the Wide Field Imager (WFI) and the X-ray Integral Field Unit (X-IFU)? In order to be able to answer such questions, detailed mathematical models of the optics and the instruments of *Athena* are being developed, in which all of their relevant capabilities are taken into account. This model is the *Athena* end-to-end (e2e) simulation software, which is part of the SIXTE simulation package.

With SIXTE, scientists can model realistic observations of astrophysical sources. Objects can be described as point sources or extended sources, with any spectral shape, time variability, and even 3D distribution. Simulations can be performed for single sources or for deep fields containing thousands of individual objects, and both, staring observations as well as dithering or slew observations can be simulated.

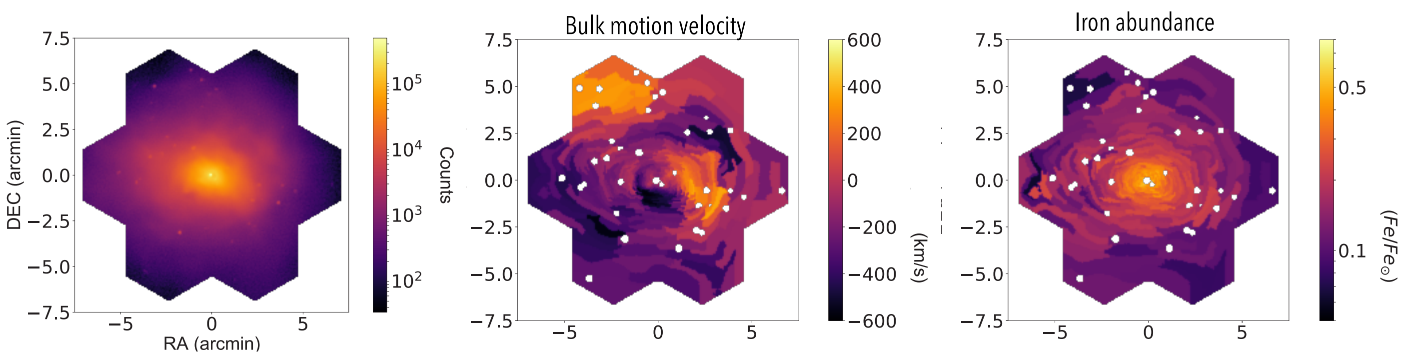
The software accurately describes the major features of the optics and the instruments. For the WFI, the simulation includes a description of the charge cloud behavior in the sensors as well as the details of the electronic detector readout. For the X-IFU, simulations include modeling the physics of the transition edge sensor and its first stage readout, including the cross talk between individual pixels, and the characteristics of the on-board event energy reconstruction. In addition, a simplified, but faster, version of the X-IFU simulator is also available which still yields a faithful representation of X-IFU measurements for deep observations involving the full instrument.

The output of the simulations are event files in the FITS-format that can be processed with standard X-ray astronomical analysis software. In addition, the end-to-end team also provides data reduction pipelines for these data, as well as other tools needed for the analysis such as, e.g., the calculation of exposure maps.



M31 simulation using a grid of 5x5 WFI pointing during which the satellite was dithering in order to remove the gap between the CCDs. The inset shows the resulting exposure map. This simulation by T. Dauser is based on existing XMM-*Newton* EPIC-pn pointings. Areas without sources were not covered by XMM.

The *Athena* e2e-software is still under active development, and will continue to be developed. We strive to always have the software in a state that represents the current design of the instruments. Our team offers documentation and example input for the simulations, and we also offer annual SIXTE simulation workshops for those who want to start using this tool.



Galaxy clusters allow astronomers to probe the early enrichment of the Universe. The figure shows a mosaic of 7 X-IFU pointings of 100ks each that are based on a numerically simulated massive (10^{14} solar masses), local (z~0.1) galaxy cluster. Left: 0.2-10 keV surface brightness map. Middle: bulk motion determined from line shifts. Right: Iron abundance profile. X-IFU simulations by E. Cucchetti, E. Pointecouteau, P. Peille, and N. Clerc; numerical cluster simulations by E. Rasia, V. Biffi, S. Borgani, and K. Dolag.

Unveiling the Hot, High Redshift Universe with the Athena WFI

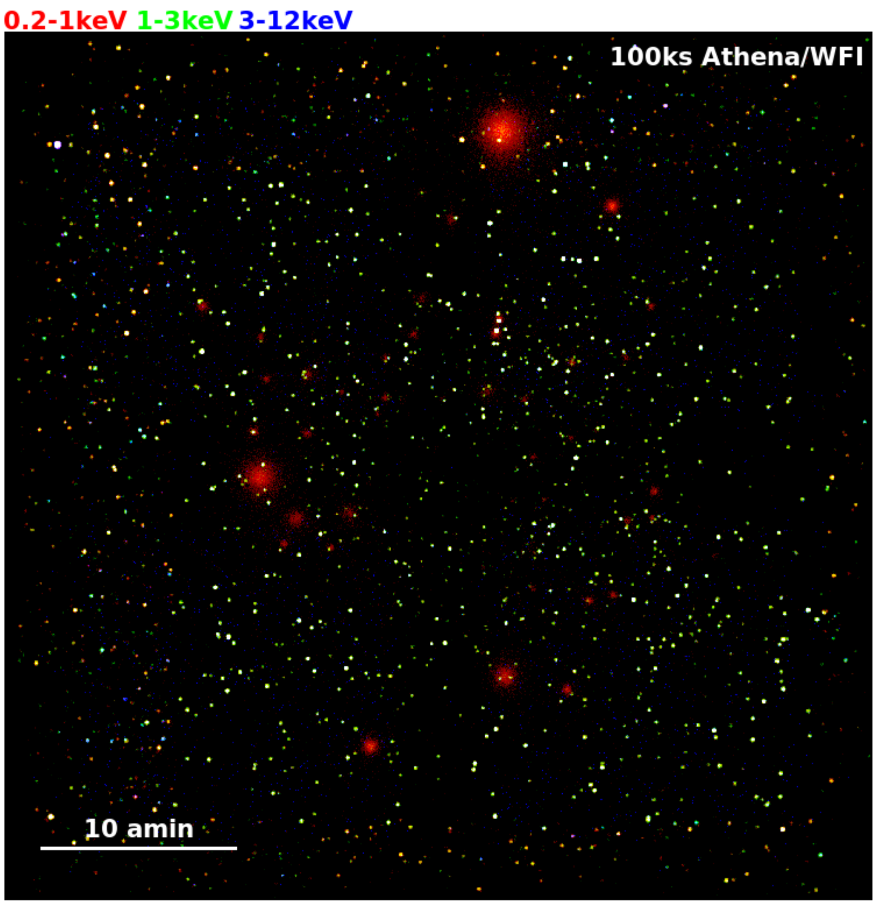
Steven Allen and Adam Mantz (Stanford University)

Studies of galaxy groups and galaxy clusters, the largest objects in the Universe, have played an important role in helping to establish the standard model of cosmology, with a universe dominated by dark matter and dark energy and structure that grows in a hierarchical manner. Cosmological tests with groups and clusters have placed powerful constraints on the mean matter and dark energy densities, the dark energy equation of state, how gravity works over very large scales, and the masses of neutrinos. Equally important, astrophysical studies of groups and clusters have provided critical insights into the nature of dark matter, how environment impacts the evolution of galaxies, the interplay between supermassive black holes and their environments, and how and when the chemical enrichment of the intergalactic medium occurred.

The foundation of galaxy group and cluster science is provided by sensitive wide field surveys. With its ground-breaking capabilities, the *Athena* Wide Field Imager (WFI) will revolutionize these studies. By exploiting fully the exceptional grasp (product of collecting area and field of view) and spatial resolution of the *Athena* mirrors, and their exquisite sensitivity at soft X-ray energies, the WFI will open a new window onto the early universe, enabling us to find and characterize the first galaxy groups and clusters that formed, more than 10 billion years ago.

Most of the normal (baryonic) matter in the Universe is in the form of diffuse gas, which is typically very hard to see. However, galaxy groups and clusters are so massive that their gravity squeezes this gas, heating it to temperatures of millions of degrees and causing it to shine brightly in X-rays. The more massive the group or cluster, the brighter and hotter the X-ray emission.

As well as determining when the first galaxy groups formed, WFI observations will show how they were then pulled together by gravity to form more massive galaxy clusters. Measurements of the rate of this growth will provide a sensitive probe of cosmology. By providing precise masses for the clusters and characterizing their dynamical states, WFI measurements will also enable a host of astrophysical studies. Working in coordination with observatories operating at other wavelengths, WFI observations will reveal the physics that drives galaxy evolution in groups and clusters, from the triggering and quenching of star formation to the activity of supermassive black holes, and the relations between these phenomena and the X-ray emitting group and cluster gas. WFI measurements will shed new light on the cycling of matter in and out of galaxy groups, being pulled by gravity and pushed by galactic winds, and the resulting chemical enrichment of the intergalactic medium.



SIXTE simulation of a single 100ks *Athena*/WFI pointing of the *Chandra* Deep Field South. Galaxy groups and clusters identified in the field are visible as extended red (i.e. soft) sources.

Athena Community People

Eleonora Troja

Eleonora is an astrophysicist at the University of Maryland and at NASA Goddard Space Flight Center. She started her career as an X-ray astronomer at the University of Palermo, and moved to the United States soon after graduation.

Her research interests lie in the field of time domain astronomy, and include the study of gamma-ray bursts (GRBs) and exotic transients such as kilonovae and tidal disruption events. Her primary focus is the connection between short duration GRBs, neutron star mergers, and gravitational wave sources. In 2017, she discovered the X-ray counterpart of the gravitational wave event GW170817. This breakthrough observation showed that gravitational wave sources produce luminous X-ray emission which can be detected by *Athena*.

She is co-chair of the Mission Working Group 5.6, Targets of Opportunity, and her goal is to maximize *Athena*'s capabilities of rapid response and field of regard, fundamental for the study of astronomical transients.

She hopes to use *Athena* to discover new types of X-ray transients, and to explore the early Universe using the brightest GRBs.

eleonora.troja@nasa.gov

Axel Schwope

Axel studied physics and astronomy in Berlin. After German re-unification he moved to the newly founded Leibniz Institute for Astrophysics Potsdam (AIP) where he works ever since. At the AIP he is leading the X-ray astronomy group. It is heavily involved in the XMM-*Newton* Survey Science Centre and in the development of eROSITA, the main instrument on the Spektrum-Roentgen-Gamma mission.

In the *Athena* universe Axel is co-chairing the topical panel on the endpoints of stellar evolution.

His scientific interests are widespread, ranging from the largest (clusters of galaxies) to the smallest X-ray emitting bodies (neutron stars) with a certain focus on white-dwarf accretors.

He hopes that *Athena* will eventually be used to perform the arts of Doppler tomography at X-ray wavelengths.

aschwope@aip.de

Graziella Branduardi-Raymont

Graziella is Professor of Space Astronomy at the Mullard Space Science Laboratory of University College London (UCL). She has a Physics degree from the University of Milano, and a PhD in X-ray Astronomy from UCL; she also worked at the Harvard-Smithsonian Center for Astrophysics, for a couple of years.

She has participated in major X-ray observatory missions: *Copernicus*, Ariel 5 and the *Einstein* Observatory in the 70s, EXOSAT in the 80s, ROSAT in the 90s. She is Co-I for the XMM-*Newton* RGS and co-leader of the Solar wind Magnetosphere Ionosphere Link Explorer mission (SMILE), jointly developed by ESA and the Chinese Academy of Sciences. Her scientific interests encompass the whole range of astronomical X-ray sources, from AGN to solar system objects (and our own Earth). The latter are reflected in the activities she carries out in support of *Athena*.

She is a member of the *Athena* X-IFU Science Advisory Team and co-chair of the Topical Panel on 'Solar system objects and exoplanets'.

She has been fascinated by astronomy and space research since she was a teenager and considers herself very fortunate to have been able to make a career out of her scientific passion.

g.branduardi-raymont@ucl.ac.uk

AHEAD Announcement of Opportunity Cycle 5

The AHEAD (Integrated Activities for High Energy Astrophysics) project solicits proposals for its program of transnational visits. This program offers access free-of-cost to some of the best European test and calibration facilities, training/mentoring on X-ray data analysis and visits of scientists/engineers at all expertise levels. Visitor grants include full reimbursement of travel and subsistence expenses.

Submission Deadlines:

- Call 1 (Experimental Facilities): 30 June 2018
- Calls 2 and 3 (Data analysis/Science/Engineering): 5 January 2018, 17:00 CET

Three main calls are included in this AO. For further information visit the AHEAD website.

Conferences

Athena in Conferences (January-July 2018)

- 231st Meeting of the American Astronomical Society, Washington (USA), 8-12 Jan 18
- *Using tidal disruption events to study supermassive black holes*, Aspen (USA), 20-26 Jan 18
- SnowCluster 2018 - *The Physics of Galaxy Clusters*, Utah (USA), 18-23 March 18
- European Week of Astronomy and Space Science 2018, Liverpool (UK), 3-6 Apr 18
- IAU Symposium 342 – *Perseus in Sicily: from black hole to cluster outskirts*, Noto (Italy), 13-18 May 18
- SPIE Astronomical Telescopes + Instrumentation, Austin (USA), 10-15 June 18
- Sociedad Española de Astronomía 2018, Salamanca (Spain), 16-20 Jul 18
- 42nd COSPAR Assembly, Pasadena (USA), 14-22 Jul 18

Coming conferences of interest

- The Olympian Symposium 2018: *Gas and stars from milli- to mega- parsecs*, Mt. Olympus (Greece), 28 May-1 June 18
- *Time-Domain Astronomy: a high energy view*, Madrid (Spain), 13-15 June 18
- *Massive black holes in evolving galaxies: from quasars to quiescence*, Paris (France), 25-29 June 18
- *Astrophysical Frontiers in the Next Decade and Beyond: Planets, Galaxies, Black Holes, and the Transient Universe*, Portland (USA), 26-29 June 18
- *The Laws of Star Formation: From the Cosmic Dawn to the Present Universe*, Cambridge (United Kingdom), 2-6 July 18
- Journées de la SF2A 2018, Bordeaux (France), 3-6 Jul 18
- *Multiphase AGN Feeding & Feedback*, Sexten (Italy), 9-13 Jul 18