October 15, 2017 N°5

The X-IFU Gazette

ATHENA X-ray Integral Field Unit

In the news:

Of the consortium news, we have learned that **Etienne Renotte** and **Pierre Jamotton** left suddenly and unfortunately the Centre Spatial de Liège, in which they had worked for more than 25 years. They were leading the study on the aperture assembly of the Dewar, a critical thermo-mechanical element of the whole assembly. We would like to express our support to Etienne and Pierre, and thank them for their contribution to the X-IFU project. Our Belgian colleagues, led by Gregor Rauw, are taking all actions to resume the CSL activities shortly.

Breaking news on the gravitational waves…

The watershed discoveries brought by the detection of gravitational waves (GW) from LIGO/Virgo on August 17 owe considerably to electromagnetic follow-up observations.

GW signal and photons produced by a neutron star (NS) merger were detected for the first time from a same event. While GWs display the tell-tale of a NS merger, photons tell us that the explosive fusion of the two NS fathers two fundamental astro-physical sources of our Universe.

The electromagnetic counterpart at optical and infrared frequencies, visible just for a few days, is dominated by the radioactive glow from freshly synthesized r-process material in the merger ejecta, known as kilonova, that could then be the main source of elements heavier than iron in our Universe.

The newly discovered X-ray counterpart (*) and, later, the radio counterpart, exhibit for the first time the long-sought-after behavior of a Gamma-Ray Burst whose jet is pointing away from earth. The discovery of GW170817 and its X-ray counterpart demonstrates unquestionably that NS mergers form highly relativistic jets powering gamma-ray bursts (GRBs) of short (< 2 s) duration. It shows that the second generation of GW interferometers will enable us to uncover a new population of weak and likely off-axis GRBs associated with GW sources, thus providing an unprecedented opportunity to investigate the properties of these cosmic explosions and their progenitors.

In the close future 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. Athena will enable us to reach out the full population within the VIRGO/LIGO observing distance.

Luigi . PIRO

Editorial: Last news about Athena

Before the summer, the Athena community, led by the Athena Science Study Team (ASST), concluded the so-called Cost-driven Observation Reprogramming Exercise, in which several cost-saving options, impacting the science performance of the mission were considered.

It was concluded that the so-called cost-constrained configuration, whose main difference with the current baseline is a reduced effective area at 1 keV by 30%, leads still a very powerful mission, compared to anything that will fly before. Although maximizing the 1 keV effective area remains a top priority, the ASST will accept the 30% reduction, if required to fit Athena within its cost cap.

Emphasis was put on keeping the field of regard and target of opportunity capabilities of the mission.

The consolidation of the cost of the cost-constrained (CC) mission is currently underway by ESA, and it is expected that industry will study the CC mission until June 2018, at which point in time, a robust mission baseline fitting the cost cap should be achieved. On its own path, the X-IFU should reach a stable baseline configuration around the end of Q1/2018, with the objective to hold the instrument Preliminary Requirement Review (IPRR) in autumn next year.Then will follow the Mission Selection Review, extending on the IPPR, and about one year after, the mission adoption.

Didier Barret

The Science Management Plan (SMP)

The Science Management Plan (SMP) is an ESA document that presents the top-level science management principles of the mission; it identifies the roles and responsibilities of ESA, the international partners, the instrument consortia funded by the Member States, and the scientific community at large. The SMP gets approved at the mission adoption

The SMP starts with a broad summary of the science to be achieved by the mission, then it summarizes the mission profile. It then presents the contributions of the various parties involved in the mission. It emphasizes the role of the Athena Science Study Team (ASST), which becomes after the adoption of the mission the Athena Science Team (AST), to be placed under the leadership of the ESA Project Scientist (PS).

The SMP describes the various type of Athena observing times: Performance Verification Time to demonstrate the key performance of the mission, the Guest Observer (GO) time made available to the worldwide scientific community through calls for observing proposals, the Guaranteed Time (GT) made available to the instrument PIs in return for the contributions of the consortia to the mission, Discretionary Time (DT) allocated by the Project Scientist, and finally the Calibration Time used by ESA and the instrument teams.

Both the GO and GT are recommended to ESA by an Observation Time Allocation Committee.

The SMP states that some fractions of GT and GO will have to be used for the so-called Key Programs (KP). KPs are comprehensive and extensive programs on some specific science goals of Athena. The current version of the SMP, before revision for the cost-constrained mission, indicates that the GT is equally split between WFI and X-IFU and that the two PIs get allocated 15% of the total observatory time (and 2.5% during the extension). These 15% will be shared between all X-IFU consortium partners in a way commensurate to their investment in the X-IFU.

The SMP ends with a description of how KP will be chosen before launch and implemented based on GO and GT, and finally lists the proprietary period of the various observing time (e.g. 12 months for GT data from the receipt of suitably calibrated science products.).

Didier Barret (IRAP, X-IFU PI)

(*) Troja et al, Nature 2017

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

CONSORTIUM MEETING N°6

Week of 11th of September
Madrid

The 6th X-IFU consortium meeting took place from September 11th to 15th in Madrid, hosted by CAB-INTA. Thanks to the organization of M. Mas Hesse and his team, the 120 attendees were able to participate to the various meetings in excellent conditions.

The splinter meetings covered several technical items (e.g. Instrument Control Unit, TES and readout chain, Power Distribution Unit, the Dewar door), performance items (e.g. background, end-to-end simulator), science and calibration activities, as well as management.

The plenary sessions proposed general topics (cost, Athena status, science requirements) as well as technical ones (current status of the sub-systems).

Thanks to Luigi Piro, the secrets of the transient Universe as will be probed by Athena, were unveiled.

Massimo Cappi

Son of a particle physicist at CERN, I was born in Geneva (CH), grew-up and graduated in the nearby French valley of the "Pays de Gex" down the Jura mountains. After listening to my father's explanations of the Universe and its fundamental laws, and reading the inspiring books of the great Hubert Reeves, I decided to try to become an astrophysicist myself.

I enrolled in the course of Astronomy and Astrophysics at the University of Bologna, Italy, in the region and country of origin of my parents.

After graduation, I moved to Japan for almost 3 years where I obtained a PhD in astrophysics using data from the newly launched X-ray satellite named ASCA. After a few months in the US, to work on Chandra data, I moved back to Italy to work on data from the BeppoSAX and XMM-Newton satellites.

My expertise has always been on the study of high-energy observations of Active Galactic Nuclei to understand how supermassive black holes in galaxies form, evolve, and accrete and eject matter along the cosmic time. I summed up with my bright collaborators > 150 refereed papers and > 5000 cit. (h-index~40).

At the end of year 1999 (yes, 20 years ago), I started working for Athena (then called XEUS, then IXO, then Athena+) and I am happy nowadays to contribute as chair of the XSAT, and as co-chair of the Science Working Group 2 (the one for the Energetic Universe) .

THE X-IFU INSTRUMENT SCIENCE CENTER MANAGEMENT BOARD

The X-IFU Instrument and Science Centre (X-ISC) is one aspect of the Athena science ground segment.

The X-ISC is responsible for all areas of the X-IFU ground segment activities. Responsibilities include aspects close to the X-IFU instrument, such as providing the instrument onboard software, surveying the instrument behaviour and instrument calibration, as well as providing the data reduction and analysis software, along with software to manually verify data coming from the satellite.

The X-ISC also aims to produce a pipeline to automatically reduce all the data and produce manually validated standard data products to be delivered to the principal investigator of the observation and to be stored in the Athena Science Archive.

Current activities include the distribution of the tasks to be accomplished, establishing requirements and specification of tasks and data products.

Once this is accomplished, and the scripting language and framework have been agreed with the Science Operations Centre (SOC) and WFI Instrument and Science Centre, writing of software will begin.

The X-ISC is coordinated by the Project Scientist, Natalie Webb (IRAP).

She is supported by a management team of 5 people, Enrico Bozzo (University of Geneva), Fabrizio Fiore (INAF), J. Miguel Torrejon (University of Alicante), Michael Wise (ASTRON) and Véronique Valette (CNES). The X-ISC benefits from contributions from many of the X-IFU consortium countries, including France, Italy, Swizterland, Spain, Germany, Netherlands, Belgium and Poland.

Natalie Webb (IRAP)

KNOW MORE ABOUT: THE X-IFU SCIENCEADVISORY TEAM, A.K.A. XSAT

The Athena X-IFU Science Advisory Team (XSAT) was first appointed in May 2014. The XSAT consists of a team of ~20 scientists who have an internationally recognised expertise in the field of high energy astrophysics for at least one of the science topics that are key science objectives for the X-IFU instrument. Broadly speaking these science topics range from the studies of clusters of galaxies (E. Bulbul, E. Pointecouteau, G.W. Pratt, J. Schaye), the warm hot intergalactic medium (WHIM: A. Finoguenov, F. Nicastro), active galactic nuclei (AGN: J. Agnieska, M. Dadina, A. Goldwurm, G. Miniutti, S. Paltani, J.M. Torrejon), X-ray binaries, tidal-disruption events and/or gamma-ray bursts (XRBs/TDEs/GRBs: P. Jonker, J. Miller, J. Wilms) of the Core Science, to the X-ray studies of planets in the Solar System (G. Branduardi-Raymont), supernovae remnants (SNRs: A. Decourchelle, J. Wink), pulsar wind nebulaes (PWN: Y. Fukazawa), and stars in the Milky Way (Y. Naze, S. Sciortino). The XSAT has been chaired by X. Barcons until March 2017 and is since then chaired by me (M. Cappi), with E. Pointecouteau having functions of deputy-chair since the XSAT was first appointed. All XSAT members have been appointed by the X-IFU PI upon agreement by the X-IFU consortium management team (XCMT) and concurrence by the consortium board (CoB).

The main role of the XSAT is to advise and support the X-IFU PI on all the scientific matters that are relevant to the instrument and its development, including some aspects of the X-IFU Instrument and Science Center.

More specifically, the XSAT members shall collectively, under the coordination of the XSAT chair, i) assess the impact on science capabilities of the X-IFU upon changes of the instrument performance parameters and/or instrument design; ii) assist the X-IFU instrument scientists and system managers in translating the Athena Science requirements into instrument specifications, iii) help in defining X-IFU related tasks for the Athena Working Groups and for evaluating the outputs of these tasks; iv) Help optimizing the science return of the X-IFU, e.g. providing inputs to the definition of the guaranteed time observing program; v) Trigger and promote the X-IFU science internally and externally; vi) Conduct any other science-related actions requested by the X-IFU PI.

In summary, the main goal of the XSAT is to "guarantee" the maximum scientific return from the X-IFU in an always (of course) impartial, up-to-date and quantified way. In closure, a personnel side note: I am very happy of being chair of this XSAT because I see a very positive and constructive collaboration from the experts in the team, and I see maximum attention on the science return (and recognition of its priority) from not only the PI (D. Barret) but also the whole X-IFU Project and Instrument Teams, which should not be taken for granted, I think.

Massimo Cappi Senior Researcher at INAF/IASF-Bo, Bologna

Head of the High-Energy Astrophysics Division of INAF (since September 2017)

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