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The X-IFU Gazette

In the news:

X-IFU official logo

WHY « X-IFU » (X-RAY INTEGRAL FIELD UNIT)?

Integral Field Spectrometers or Units (IFUs) are revolutionary instruments in the sense that they make images, with each pixel containing a high spectral resolution spectrum.
In its previous incarnation, back to the XEUS/IXO/Athena-L1 ages, the micro-calorimeter instrument was named XMS (standing for X-ray Micro-calorimeter Spectrometer).
While proposing the Athena mission for the L2 science theme, at a time when IFUs were becoming very popular in the focal plane instrumentation of the largest ground based telescopes (e.g. at the VLT with the Multi Unit Spectroscopic Explorer (MUSE)), we thought that the name X-IFU would convey to the broad astronomical community a very positive image of a breakthrough instrument that would become available for the first time in the X-rays.

Editorial

I am really pleased to announce the first issue of the **X-IFU gazette**.

The gazette is conceived as a flexible communication tool for the X-IFU Consortium at large. You will find information regarding both the technical and scientific aspects of the X-IFU (e.g. meetings, important information regarding the technology developments, the milestones of the project, presenting the science behind the instrument...).

In order to better know who makes up the very large X-IFU consortium, each issue will contain also a description of a partner institution, as well as a brief description of its contribution to the X-IFU, and even the portrait of a key person in the partner institution.

The tone of the gazette will be informal. Its format is intended to be light and aired so that it can be read quickly and pleasantly

It will be stable so that you will easily find the articles of your own interest.

The X-IFU gazette will be issued every two or three months, depending on what material builds up. It is distributed electronically and archived on the X-IFU Consortium web site (http://x-ifu.irap.omp.eu). As deemed necessary you may circulate it around you.

To conclude, the X-IFU gazette is expected to improve the communication within the X-IFU Consortium and I hope we can count on your support to make it as lively, informative and entertaining as possible.

Enjoy your reading!

If you have any suggestions or comments about its format, content, etc., you may contact directly Françoise Douchin (Francoise.Douchin@cnes.fr).

Didier Barret

X-IFU: THE KEY ISSUES

The design of the **FPM**, acronym for Focal Plane Module, and the organization for its development have been the point of discussion for several months now.

The ESA-Mission Consolidation Review (MCR) has identified the need for a better definition of the Focal Plane Module and proposed as a way to reduce the cost at completion of Athena to ESA to transfer its responsibility to the payload. The name FPM is by itself very instructive of the problem because it should have been named **PLM** for Payload Module or **PIM** for Payload Interface Module.

A general consensus is not easy to find because the FPM is a crossroad where intersect the two payload X-IFU and WFI consortia, ESA and the Primes.

What are at stake are technical matters of course but also programmatics matters. One issue is the AIV sequence of the Flight Model.

The consensus between all the parties must be found quickly in order to close the MCR and then to allow the ATHENA AO to be issued.

Thien Lam-Trong

WORKSHOP

MULTIPLEX AND READ-OUT

September 26, 27, 28 a.m. IRAP

Two and a half days of fruitful exchanges...:

- To share the X-IFU baseline design and its parameters (3 840 pixels, uniform array, FDM mode, etc.).
- To define a list of criteria that could help to assess the three known multiplexing modes: FDM, TDM, CDM.

X-IFU SUMMER'S DIET...

One major outcome of the ESA Mission Consolidation Review (MCR) is the overweight of the satellite and consequently the overweight of the X-IFU payload.

At the beginning of the summertime, all the instrumental dietary specialists were contacted and a strong-willed strategy of design-to-mass has been setup, which is fully fruitful this fall.

• The « solid » Dewar belt has been optimized in order to keep substantial thickness only where it was necessary; likewise, the legs (struts) have been thinned.

• The heat shields have been scrutinized and one of them was simply deleted.

• X-IFU is a « cold heart » patient: his health is based on a gradual cooling of its internal different layers to achieve 50 mK heart's temperature; that is not easy!

A deep thermal architecture revisit has been engaged allowing a dramatic reduction of the number of machines and therefore, mass.

• The X-IFU read-out electronic chain is also concerned by overweight and each of the components have been asked to make an effort:

o The Digital Read-out Electronics internal functions have been gathered, reducing the number of boxes (and therefore the mass),

o Nominal and redundant functions have been grouped in the same case for some functions, and cross-straps cancelled (concept of half-instrument).

Today, X-IFU left the red zone of overweight with some avenues for further improvement:

• mechanics and thermal engineers continue to track leaks (Aperture cylinder);

• possible lowering of the surrounding temperature for X-IFU to achieve more easily the 50 mK;

• optimized layout in the future FPM;

• and other ways ...

Françoise Delcelier-Douchin & Alice Pradines

Jan-Willem den Herder

X-IFU co-PI, Jan-Willem is as program scientist employed at SRON Utrecht. After his graduation at the University of Amsterdam he joined space research. Starting in the gamma-ray regime (COMPTEL-GRO) he moved to lower energies and was responsible for the delivery of the Reflection Grating Spectrometer on XMM-Newton. Since then he participated in many studies and he was responsible for the Swiss/Dutch contribution to the Japanese Hitomi mission. The Modulated X-ray Source (MXS), which was developed for Hitomi, will also be used for Athena.

KNOW MORE ABOUT: SRON LAB.

SRON, the Netherlands Institute For Space Research has a long track record in science and instrumentation with high-spectral resolution instruments for the soft X-ray band.

It has, as principle investigator, build grating instruments on the **Chandra** and **XMM-Newton** observatories and has also realized a spectral fitting code which allows to interpret the obtained spectra and decompose it in the relevant parameters (ionization balance, temperature, densities and abundances for the different conditions of the plasma's).

Already before, has recognize the need to develop imaging capability with sufficient spectral resolution to identify and characterize emission and absorption lines in extended sources.

Following the exploration of Superconducting Tunnel Junctions it was clear that the Transition Edge Sensors. Whereas initially this technology was focused on the X-ray regime, around the end of the last decade the emphasis was shifted to the read-out of bolometers in the IR regime.

Following the selection of Athena as L2 mission, we were in the good position to shift our focus back to X-rays.

Over the last year we have studied in great detail the physics of the detectors and the optimization of the read-out system. The 2.5 eV resolution requires that all steps in the read-out chain are optimized and nicely match with the other components. We have been working on this in close cooperation with VTT in Finland (where the SQUIDs are developed) and our colleagues in the US (NASA/NIST/Stanford) where the sensors are optimized.

Our collaborations date back to the early dates when ESA, NASA and JAXA studied together the International X-ray observatory (IXO).

In SRON we have a team with a mixture of scientists, engineers and technicians.

The short term focus is to build a demonstration model for the detector allowing the read-out of up to 40 pixels in a single chain and the design of FPA for the Detector Cooling System (demonstrator) of the full instrument.

Jan Willem den Herder

Contact us ....
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