

ATHENA X-IFU WFEE
Séminaire projets APC - 2023
Damien PRÊLE - 24 Mars 2023

ATHENA in the ESA Cosmic Vision

Space science programme of the European Space Agency



L1 Jupiter Icy Moon Explorer - **JUICE**

Jupiter system launch 13 April 2023 (Ariane 5)



L2 Advanced Telescope High E. Astro. - **ATHENA**

X-ray observatory launch planned late 2030




L3 Laser Interferometer Space Antenna - **LISA**

Gravitational waves launch planned late 2030

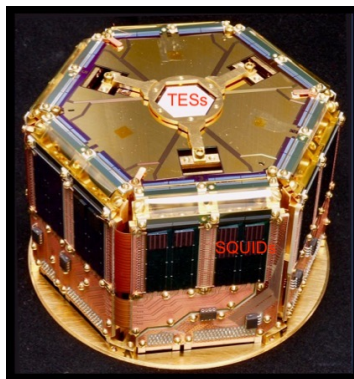
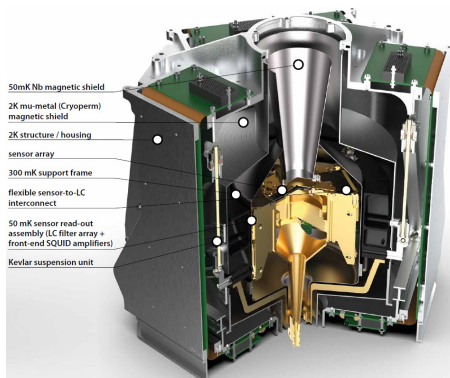


Athena project development - current status

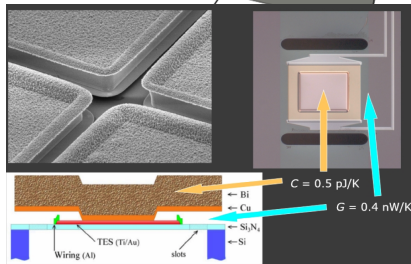
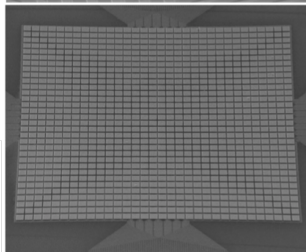
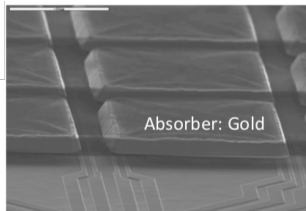
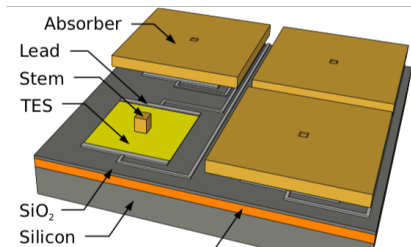
- ▶ **Athena selection in 2014 by ESA** ...after ATHENA+ IXO XEUS proposals ...
- ▶ The **WFI and X-IFU instruments consortia** officially endorsed by ESA in December 2018 → successful **Instrument Preliminary Requirements Review** - IPRR in 2018/2019
- ▶ **Phase A ended on Nov. 2019** with Mission Formulation Review → Phase B
- ▶ **Reformulation phase on Summer 2023**  ESA Cost below 1.3 billion € → **passive cooling**
- ▶ **Nouvelles rassurantes** *"... nouvel X-IFU ... valorise pleinement ... hardware X-IFU (APC, CEA et IRAP) ... preserve les performances ... phase de fortes turbulences ces derniers mois... a nouveau sur de bons rails ... "* D. Baret PI



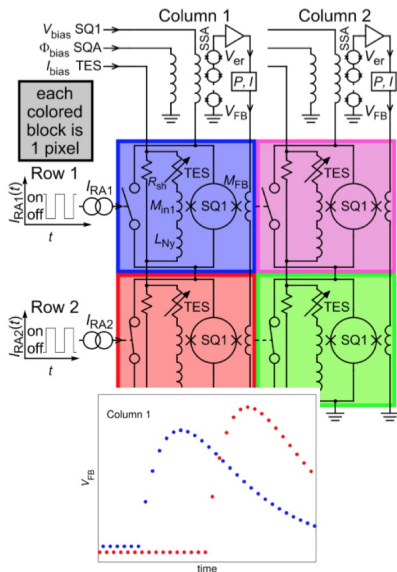
X-IFU Focal Plane Assembly - FPA



Transition-Edge Eensor - TES



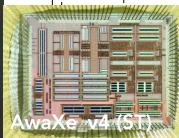
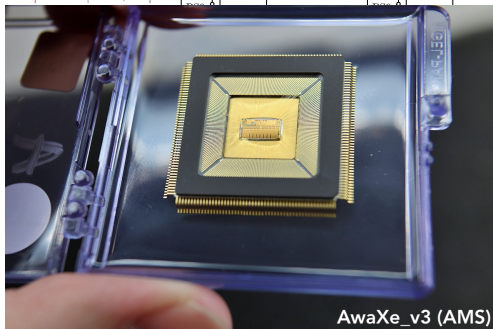
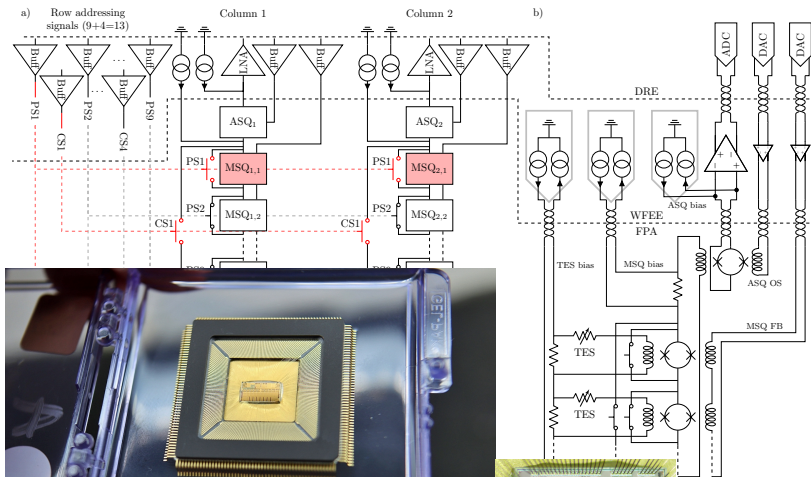
Time Domain Multiplexing - TDM (move from FDM to TDM in 2019/2020)



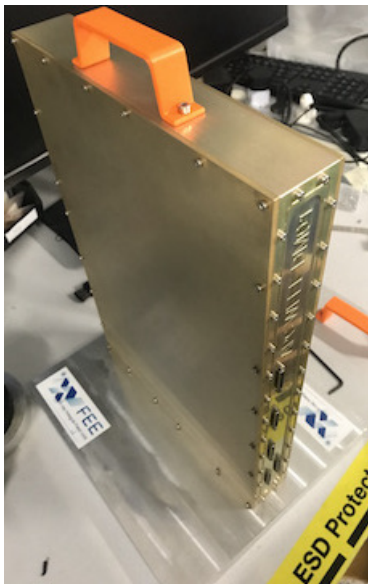
- ▶ 34:1 mux factor
- ▶ SQUID MHz switch ON/OFF
- ▶ Each pixel sampled at 180 kHz
- ▶ Interleaved signals demux @ 300 K
- ▶ Linearize SQUID feedback generated with 1 frame delay
- ▶ 96 -> 32 readout channels
- ▶ Ground-based demo 8x32 demo ΔE 2.23 eV @ 7 keV



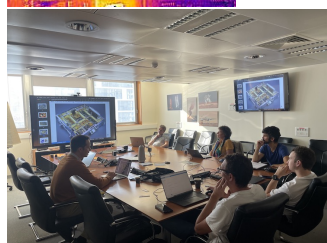
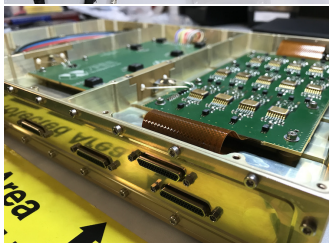
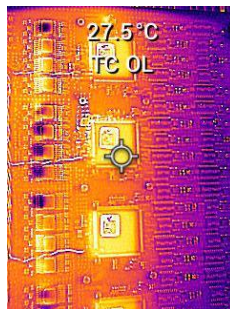
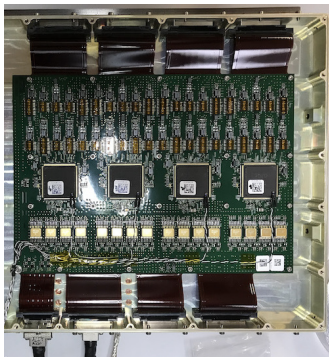
Warm Front End Electronic - WFEE in the X-IFU TES Readout



WFEE Demonstrator Model



WFEF Demonstrator Model + thermal analysis (CDF Pole Spatial UPC)



ATHENA X-IFU WFEE Team

