

Update on the Athena-to-NewAthena Reformulation Exercise

M. Cappi (chair of XIFU Science Advisory Team)
and L. Piro (Lead of Italian contribution to Athena)
on behalf of the X-IFU consortium

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Context and Programmatic

- While Mission Adoption Review (expected to end Nov. 2022) proceeded well with both I-SRR of WFI and X-IFU **successful**, cost ROM early 2022 (phase B1) from Primes/ESA estimates assess a CaC **to ESA** of 1.9G€ (~30% > 1.4 G€ of previous CaC estimate)
- ESA stopped, thus postponed, process and asks for **a major simplification/reformulation of the design** to reduce cost to ESA by ~40%, down to Cost-cap of 2.6G€ for LISA+Athena, i.e. <1.3G€ for Athena. LISA to comply with a similar cap, having an estimated cost at end of phase A of ~ 1.5G€
- ASST (formally) dismantled, two new teams: Mission Reformulation Team (MRT) and Science Reformulation Team (SRT),
MRT=ESA+Pis/consorzia+NASA+JAXA
SRT= co-chairs Guainazzi & Cruise + a dozen new scientists appointed
- Goal is to reach **a new (reformulated) design within Q1/2023**, then Industry will assess feasibility+cost, and SRT will assess “flagship” status/science case, then expect an accelerated Delta Phase A/B1 starting by end of 2023
- Adoption likely postponed to ~2027. The substantial system simplification => a shortened implementation phase (8-9 years vs current 10-12 yrs). Possible (likely?) swap of MAR with LISA (TBC in Q1-Q2/2023).

Reformulation Study – Update

- The **high resolution spectroscopy with imaging** (XIFU) is necessary condition for cornerstone/flagship status (Athena Independent Science Review Report)
- Need to reduce cost to ESA of payload by $\sim 40\%$ \rightarrow implies **a major simplification of X-IFU and cryo-chain** which drive costs, risks, etc. to ESA
- Two very different designs under study:
 - hot (300K) dewar, as is now, BUT with NASA cooler (300K \rightarrow 4K) to replace 4 ESA/European coolers (+50M€ from NASA to X-IFU, shifted from MSFC calib. Facility.) Technically feasible, and likely much cheaper, BUT programmatic difficulty to provide cryostat other than ESA (ES or JAXA are still TBD).
 - passive cooling system** (30 or 50K downward), with V-grooves passive coolers “à la Herschel/Planck/LiteBird” \rightarrow **massive simplification in cryostat**, programmatically feasible (US MIRI cooler recurrent provision, JAXA cryostat OK, from 700 kg to <300 kg, Impact on AIV/AIT TBC). **No showstopper identified to date.** Impact on space for WFI (FoV/heat power) TBC.
- **FPA simplifications of X-IFU** (FoV from 5' to $\sim 4'$, slower TES pixels, DeltaE from 2.5 eV to 2.8 eV @ 7 keV, reduction but moderate of FoR under option ii). **All options under discussion do retain the flagship status of X-IFU & Athena!**
- Possibly reduction of effective area by \sim few 10s % below 1 keV. PSF requirement likely frozen at best 8" (HEW), as per ESA and AISR statements.

Way forward & Conclusions

- Stay tuned, we plan to **get the community informed and involved** via the new SRDT Team (lead by M. Guainazzi + M. Cruise) and the **MRFT** (via XIFU and WFI consortia).
- ASI is supporting redefinition activities, that are currently strongly supported by the Italian consortium (both science and h/w) but plans to rediscuss >2024 the reformulated design next year.
- Good prospects to get a programmatically stronger mission retaining its cornerstone status.
- Athena/NewAthena shows how **“Space is hard, very hard”**, but **keep fighting** and **stay united with us**, for the sake of our community.
- Athena/NewAthena is still alive, and kicking!, and our only chance for a European X-ray Observatory **flagship** mission (after XMM, last chance)