NASA ATHENA Science Ground Segment

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NASA ATHENA Science Ground Segment Overview

- The NASA contribution to the ATHENA Science Ground Segment (SGS) will consist of:
  - Contribution of algorithms and code to the ATHENA science pipelines. Presumably would follow same distribution as in Europe of 90% ATHENA science pipeline will be to ISCs, 10% to SOC-level development, e.g., ACSS
  - Contribution to ground and flight science calibration data and software
  - Establishment of a NASA ATHENA Science Center (currently planned to start after 2025) that will mirror ATHENA data and science pipeline code, support US PIs on ATHENA observing proposals and coordinate US SGS contributions.
- NASA SGS contributions to ATHENA are *not* part of the $150M "cap" for NASA contributions except for contributions within the instrument hardware teams (e.g., calibration software)
- The NASA ATHENA SGS effort will also include a Guest Observer Program to provide grants to the US-based ATHENA GO PIs, starting ~ one year prior to launch and continuing through the four year prime mission.

Current Status

- NASA ATHENA SGS plans presented to an Independent Programmatic and Cost review of entire NASA Athena program on Oct. 7, 2020.
- Regular meetings with SIXTE team
- A. Ptak representing NASA at ~ monthly ATHENA ESA-ISC SGS coordination and ACSS meetings

NASA ATHENA Programmatic Review

- Presented current estimate for lifecycle NASA ATHENA SGS effort of ~ 100 FTEs based on NASA SGS contribution to past ESA missions (XMM-Newton, Integral, Herschel)
  - Plan currently has additional ~30 FTEs to support GO grants and NASA ATHENA Science Center management (i.e., 130 FTEs total)
    - I.e., NASA ATHENA Science Center is planned to be competed and therefore may require infrastructure outside of the NASA ATHENA Project at Goddard
- Programmatic Review was overall favorable
  - Commented on initial BAM effort being considered “hardware” while XRCF calibration science support was not
  - From review report (concerning total science budget):
    - Deferring the decision of whether to assign or compete the management of the SGS is the most significant cost risk identified (to the total LCC).
      - Either way, peer review will stimulate creativity to enhance efficiency and cost savings
- No immediate impact from review report on near-term (5 year time scale) NASA budget planning

NASA X-IFU SGS Plans

- Currently no explicitly defined NASA roles except for contributions towards simulation software and calibration data that would evolve to be part of the ATHENA SGS later
  - Current NASA/GSFC scientist support of TESSIM and XIFUSIM are part of the X-IFU hardware effort
- Expectation is that NASA experience with XRISM will be leveraged towards X-IFU pipeline algorithms and software
- NASA X-IFU hardware effort includes extensive calibration program that could similarly be leveraged for CALDB software and data

NASA WFI SGS Plans

- NASA WFI team contribution of WFI background simulations and algorithms is a formal NASA contribution to the WFI (was originally the BAM module on the WFI Science Products Module)
  - Currently is a hardware effort, mostly based on GEANT4 simulation work
  - Planned to be supported as a hardware effort through FY24
- After establishment of a NASA ATHENA Data Center ~ 2026 this effort would likely transition to being part of the NASA Athena SGS contribution and hence not part of a “hardware” contribution
- NASA is also currently supporting *preliminary* work on transient analysis software planning (i.e., the TAM on the SPM)
  - Rapid transient analysis is not yet part of the ATHENA baseline plan in Europe as a mission requirement

Other Potential NASA ATHENA SGS Contributions

- Contribution toward ATHENA Common Software System
- Mirror calibration software (NASA XRCF is baseline testing facility for the ATHENA mirror)
  - ARF and PSF calibration data and software
- Science simulation support
  - Contribution towards SIXTE in general (already happening)
  - Participation in end-to-end simulation tests of ATHENA pipeline software and “data challenges”
- Contributions towards level-3 software and lab astrophysics, preferably from the US community in general
- Specific requests from the ISCs TBD later as SGS effort becomes better defined

Backup-

NASA ATHENA SGS Staffing Plan

- Staffing plan from April 2020, has not incorporated recent mission schedule changes
  - slow ramp-up with peak at ~ one year before launch
- Current staff
  - Deputy project scientist for SGS (Andy Ptak)
  - Two part-time support scientists (Katja Pottschmidt, Panayiotis Tzanavaris) who are helping with SGS planning and communications (web site, coordination of NASA ATHENA meetings)
- Near-term plan
  - Build up staff to support NASA SGS contribution planning, leading to establishment of NASA ATHENA data center
    - Support of science simulation activities (SIXTE)
    - Coordination with instrument team hardware efforts
    - Determination of NASA SGS contributions

NASA ATHENA SGS Staffing Plan

Notional distribution of ~ 130 FTEs but also being used for near-term funding requests

Year	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	FY38
Deputy Project Scientist	0.7	0.8	0.8	0.9	0.9	1	1	1	1	1	1	1	1	1	1	1	1	1
SGS senior scientists										1	2	2	1	1	1	1	1	0.5
SGS support scientists	1	1.6	1.6	1.7	2	2	2	3	3	4	5	5	4	4	3	1	1	0.5
SGS programmers					0.5	1	1	2	3	3	4	3	3	2	2	1	1	0.5
Data Center Management						0.5	0.5	0.5	1	1	1	1	1	1	1	1	1	1
Data Center Budget Personnel						0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
GO Support Team								1.0	2.0	2.0	2.0	2.0	3.0	4.0	4.0	4.0	4.0	3.0
Total FTEs	1.7	2.4	2.4	2.6	3.4	4.6	4.6	7.6	10.1	12.1	15.1	14.2	13.2	13.2	12.2	9.2	9.2	6.7