

PhysPAG XR-SIG Report Out

**Jay Bookbinder (SAO)
jbookbinder@cfa.harvard.edu
January 5, 2014**

XRSAG-subscribe@lists.nasa.gov

Outline

- Organization update:
 - Mark Bautz (MIT) named to PhysPAG EC and will co-chair XR-SIG in 2014 & assume chair in 2015
- Recent XR-SIG meetings & activities
- Near term XR-SIG plans
- Upcoming XR-SIG meetings

XRSAG-subscribe@lists.nasa.gov

Recent XRSIG meetings / activities

- Session at the 13th HEAD meeting
 - April 6-11, 2013 in Monterey, CA
 1. Updates on mission studies
 2. Updates on technology progress
 3. Tech Dev Plan WG
- Session at current AAS - Focus on X-ray Optics
 - OP Gratings: high resolution (2000) <1 keV bandpass, with good efficiency (40%) (Ulowa)
 - New work on contact-less slumping & figure correction via ion implantation. Also significant progress on CAT gratings, with improvements in wall uniformity and smoothness.. TRL 5/6 by end of this year (MIT)
 - Combined ceramic/metal integral shells (SAO).
 - Positive results on integrated piezo actuators/controls; piezo yields are 100%; accelerated life testing (SAO/PSU)
 - Tech Dev mirror modules now at ~10 arcsec, passing environmental tests.
 - Progress on differential coatings, and on deterministic polishing on thin full-shell optics(MSFC).
- Provided inputs to NASA/HQ on potential US contributions to Athena.

The L2/L3 Process & Timeline

- Call for Themes in March 2013
- Submission of Themes in May 2013
 - ESA did not invite US participation in mission concepts
 - 32 White papers received
- Workshop September 2013
- Senior Survey Committee report October 2013
 - Based on white papers, workshop & technical review by AWG, SSEWG and PSWG
- Acceptance by ESA SPC in November 2013

- Call for Missions in ~February 2014
 - US participation may be invited; to be negotiated
- L2/L3 Launch date 2028/2034

Selection Criteria

Senior Survey Committee Theme Selection Criteria:

- the likelihood that the proposed science theme will lead to **fundamental and transformational results** in its specific field and beyond,
 - the **breadth of the science** theme,
 - whether the science could be achieved with ground-based techniques, or with planned smaller space projects within the L2/L3 time frame,
 - whether an L-mission in the field would give the ESA's scientific community the possibility **to achieve international leadership**,
 - the likelihood of **mastering the necessary technical challenges** of the probable concrete mission scenario(s) of the science theme, within the time and budget of the L2 or L3 mission.
-
- SSC reached a unanimous decision for:
 - an X-ray observatory, addressing the science theme “The Hot and Energetic Universe” for the L2 launch opportunity,
 - a gravitational wave observatory, addressing the science theme “The Gravitational Universe”, for the L3 launch

The L2 Mission Characteristics

The SSC recommended:

- High-throughput optics (of the order of 2m^2 collecting area) with
- Good angular resolution (5 arcsec), coupled with
- High spectral resolution (e.g. 2.5 eV)

Resulting Near-term Implications for US

- Ended NASA's support for potential Probe-class (\$1B) X-ray mission
- NASA formally suspended STDT activities as of December 12, 2013.
- Planned US Support for Athena
 - NASA funding limit ~\$100 to \$150M
 - consistent with 20% of €1B mission limit from ESA
 - For pre-launch efforts (mostly hardware)
 - Inputs provided to NASA via XR-SIG and individuals
- How will participation occur?
 - Competed via NASA AO
 - Include both hardware and memberships in SWG and other mission groups

X-ray Science Interest Group Role

- Open call to XR-SIG exploder for concepts
- Goal: Rapid submission to SMD/APS
 - Provide uniformly-formatted set of options for US contribution
 - Broad range of concepts welcomed; not censored/vetted by chair or others
 - No engineering assessments made for these particular submissions; some based on previous studies.
- 3 telecons over 2 weeks with 10-30 people in attendance for each

Response Format

- Scientific Justification & alignment with Decadal goals (if applicable)
- Potential Performance Capabilities (if applicable)
- Cost ROM (not including ESA- or member state- associated costs, nor costs to reach TRL 6 if needed)
- System impacts & interfaces
- TRL status (if applicable, plus cost to reach TRL 6 if known)
- Open Issues/Questions (if applicable)
- Brief summary of Pros and Cons (technical, political, etc).
- Collaboration type (ESA/Member State/Other)
- Interested Athena+ Collaboration members (if known).

Concepts Received with Template Response

- X-ray optics or optics technologies, or portions thereof
- Hard X-ray telescope, or portions thereof
- Calorimeter instrument, portions thereof
- Grating spectrometer, or portions thereof
- Wide Field Imager, portions thereof
- Polarimeter, or portions thereof
- Moveable instrument platform (MIP)
- Calibration support (facilities)
- Science Analysis & Simulation software
- Filter technology/Filters
- Additional ground station

Summary of Inputs

- Costs ranged from \$10M - \$150M+
- Concepts included full instruments, components of instruments and/or S/C subsystems, and calibration support.
- Concepts not necessarily pre-approved by or discussed with European partners
- Some concepts did identify ESA or Member State collaborators
- No “surprises” – submissions were in line with expectations.

Assessment of US X-ray Astronomy

- Health of US X-ray Community
 - Hardware groups
 - A few (1-3?) will see \$150M in US/Athena support
 - In difficult situation – most Athena \$\$ likely to support calorimeter efforts
 - Need continued investments in SAT – new optics and instruments essential for future missions from balloons to major missions. **But no strategic mission(s) – or associated science goals – have been identified.**
 - => Valley of Technical Death
 - Science community
 - Currently a healthy flow of data, but limited funding opportunities
 - Relying on Chandra, XMM-Newton, Suzaku
 - NuSTAR [GO program being proposed as part of SR for 2015+]
 - Successful launch of Astro-H [GO program], NICER [GO via SE proposed but not approved], and SXG [no US GO].
 - Athena data access
- No new major X-ray mission in US until ~2030 or later
 - SMEX, EX opportunities available

XRSIG Near Term Plans

- Support the Technology Development Planning (PATR process) for the critical technology for the all future missions (mirrors, calorimeters, gratings),...
 - Including tech dev requirements for 2020 mission(s) submissions
- Act as a forum for presenting technology development progress to the community
- Maintain community involvement through XRSIG to prioritize science objectives (starting from *IXO* and *NWNH* and the recent 30-year plan) for the 2020 Decadal.
- Initiating a series of questions to the XR-SIG community regarding the (next slide)

Future XRSIG meetings / Presentations

- **Session at APS meeting (Savannah, GA) -**
 - April 2014
- **Session at HEAD meeting (Chicago, IL) -**
 - August 18- 21, 2014
 - XR-SIG date August 17 (TBR)
- **Future Optics Workshop**
 - August 22, 2014 (day after HEAD meeting)
- **Future of X-ray Astronomy**
 - Kickoff meeting at AAS (Boston / June 2014)
 - Potential workshop at HEAD meeting (August 2014)
- **Potential Quarterly webcons**

BACKUP

ESA Senior Survey Committee

- Members:
 - Prepared by the Senior Survey Committee:
 - Dr. Catherine Cesarsky (CEA, Chair)
 - Prof. Willy Benz (Bern University)
 - Dr. Sergio Bertolucci (CERN)
 - Prof. Giovanni Bignami (INAF)
 - Dr. Thérèse Encrenaz (Meudon Observatory)
 - Prof. Reinhard Genzel (MPE)
 - Dr. Jason Spyromilio (ESO)
 - Prof. John Zarnecki (Open University)
- Report: http://sci.esa.int/ssc_report