Call for White Papers for Cool-Attitude Targets

Due Date: 19 October 2018 6PM EDT

Introduction

The Chandra X-ray Observatory (CXO) is a high sensitivity, high spatial resolution X-ray telescope launched in July 1999. The CXO orbit is highly elliptical with a (local) minimum apogee (in Dec 2017) of 129,000 km. The orbit allows for high observing efficiency as the Observatory spends most of the time (≈75%) well above the radiation belts. The CXO can be pointed to any position in the sky except avoidance regions around the Sun, Moon, Earth, and anti-sun direction. However, there are significant restrictions in the durations of observations at various solar pitch angles (i.e., angles between viewing directions and the direction to the sun). These restrictions are necessary to avoid overheating (or excessive cooling) of various observatory sub-systems. For example, it is crucial to avoid overheating the ACIS focal plane and electronics.

The scheduling of Chandra targets must simultaneously satisfy any science constraints on the observations (e.g. must be done in a specific time window) and the requirement to keep various sub-systems within operational thermal limits. The final schedule for any given week is a delicate balance of heating and cooling: If a target is constrained to be observed at hot pitch such that the temperature of a particular sub-system approaches the operational limit, a target at cool pitch must be observed directly afterwards to lower the temperature. Sometimes it is necessary to pre-cool a particular sub-system before observing a target at hot pitch. To date, it has been possible to schedule targets maintaining sub-system temperatures within operational limits, without impacting observing efficiency. (The Observatory has never been pointed at blank sky to “cool off” because a cool target was not available.) However, the thermal constraints are becoming more restrictive as the multi-layer insulation on the Observatory continues to degrade. To avoid future impacts on observing efficiency, a large pool of targets distributed across the sky (but avoiding the ecliptic poles) is required so that a cool-attitude target is always available for mission planning.

Cool-Attitude Targets (CATs)

This white paper call requests suggestions for lists—either existing or custom catalogs—of astrophysical objects that provide a deep reservoir of targets to be included in the observing schedule as needed to satisfy thermal constraints. Chandra observations of CATs should have intrinsic science value, noting in particular that it is likely that a random subset will be observed. We estimate that an oversubscribed list of 3000-5000 targets (CATs) uniformly distributed across the sky, but avoiding the ecliptic poles, will be required to facilitate thermal management of

the Observatory for 2-3 years. The following will apply to CAT observations:

- A CAT will be scheduled only if there is no GO/GTO target at the appropriate pitch angle.
- There is no guarantee that a specific CAT or a minimum number of CATs will be observed.
- If a list is approved as a source of CATs, potential targets that are already in the Chandra archive or in the ObsCAT will be removed from the CAT database, unless there is scientific justification for repeated observations (e.g., a variability study).
- Scientists proposing through Chandra GO/GTO programs can include observations of CATs. Approved GO/GTO targets will then be removed from the CAT database of available targets.
- CAT observations will become public immediately.
- Funding to analyze CAT data may be sought through a Chandra Archival Research proposal.

Call for CAT White Papers

Lists of CATs—either existing or custom—from all areas of astrophysics will be considered. Justifications for a particular list:

- A general description of the list and any catalog(s) included and any selection criteria (e.g., quasars with z<1.0 or minimum flux to optimize the chance of X-ray detection)
- The scientific rationale for choosing the specified list, including relevance to the Chandra mission

- The total number of targets in the proposed (existing or custom) list.

- The White paper should demonstrate that scientifically useful detections or limits can be obtained in the required exposure time range (see below)

Any given position on the sky (outside the ecliptic poles) is at cool pitch for a few weeks in each calendar year. Therefore lists that distribute CATs uniformly throughout the sky are preferred over lists that focus on one area.

The following restrictions apply to CATs:

- Exposure time per target will be between 10 and 35 ks.
- No CATs will be accepted that are outside ±40° ecliptic latitude.
- For ACIS observations, a maximum of 4 CCDs may be requested.
- The HRC may be used.
- Observations with gratings are allowed,
- No constraints or preferences may be specified for CATs. TOO programs are not supported under this initiative.

White papers for CAT source lists will be evaluated by a panel of reviewers including CXC staff, MSFC Project Science, and outside experts. There is no upper limit on the amount of time in the CATS reservoir: Any lists that have potential for excellent science can be accepted. The review panel may prioritize the accepted lists. The authors of accepted white papers will be invited to work with CXC staff to provide instrument configurations.

White Paper Submission and Resources

White papers are due 19 October 2018 6PM EDT, and should be limited to four pages of text, diagrams and references. White papers should be emailed to aprestwich@cfa.harvard.edu.

Chandra Multi-Order Coverage maps (MOCs) may be used to visualize the sky coverage of public Chandra observations. Instructions for use of MOCs, including their use with Aladin and TOPCAT can be found at http://cxc.harvard.edu/cda/cda_moc.html#mocuse

Potential authors are encouraged to submit questions via the Chandra Helpdesk.