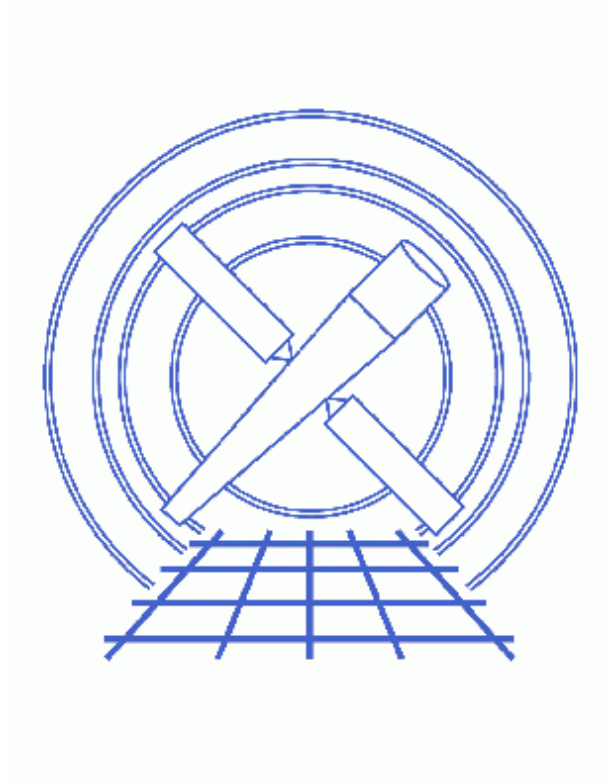


# **Following a soft X-ray transient returning to quiescence -- an example of a TOO observation with follow-ups that have different instrument configurations**



## **Proposal Threads for Cycle 11**

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# Following a soft X-ray transient returning to quiescence -- an example of a TOO observation with follow-ups that have different instrument configurations

## Proposal Threads for Cycle 11

### Thread Overview

Prior to Cycle 7, a follow-up to a TOO was required to have the SAME instrument configuration as the trigger observation. Any change in the instrument configuration required that the follow-up be entered as a new target. Such changes include:

- adding or removing a grating
- changing the science instrument -- switching from ACIS to HRC or vice versa
- changing instrument parameters -- e.g. adding or removing an ACIS subarray
- Changing the SIM offsets

This restriction has now been lifted, which required significant changes to the Remote Proposal Submission (RPS) forms. The purpose of this thread is to illustrate how to fill in the Chandra RPS forms so that the TOO and follow-up observations are correctly specified. It describes a series of observations of an X-ray transient as it returns to quiescence from a burst state. The initial TOO is triggered when the source is in a high state, and several follow-up observations are scheduled to monitor the source as the flux decreases. When the source is bright the High Energy Transmission Grating is used to obtain a dispersed spectrum. As the source gets fainter ACIS is used without a grating.

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### Science Background

This thread is based on the accepted Cycle 6 proposal 06400115 titled *Following a black hole candidate soft X-ray transient returning to quiescence*, PI P. Jonker. The main observational goal of the program is to test whether the empirical relation between the radio and X-ray flux in low/hard state of Black Hole Soft X-ray Transients (BH SXTs) extends to lower flux levels. Candidate sources are identified with RXTE. The TOO is triggered when a source is found to have a RXTE/PCA count rate of 10 counts per second and a radio flux of 2.5 mJy at 5 or 8 GHz. The following sequence of Chandra observations are then performed:

- The first Chandra observation (the trigger observation) takes place approximately 30 days after the TOO is initiated and uses ACIS-S/HETG. The exposure time is 5 ks

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## A TOO Observation with follow-ups that have different instrument configurations. - POG Cycle 11

- The first follow-up observation also uses ACIS-S/HETG and is scheduled 16-25 days after the trigger observation. The exposure time is 5 ks.
- The second follow-up observation uses ACIS-S with no grating and is scheduled 8-12 days after the first follow-up. The exposure time is 10 ks
- The third follow-up observation uses ACIS-S with no grating and is scheduled 8-12 days after the second follow-up. The exposure time is 20 ks
- The fourth follow-up observation uses ACIS-S with no grating and is scheduled 8-12 days after the third follow-up. The exposure time is 40 ks

The spacing of the observations and exposure times are based on the expected decay curve for this type of source. Radio (VLA) observations are scheduled within a day of the Chandra observations. Please note that with the exception of the VLA, coordination with ground-based observatories is only available as a preference and will be carried out on a best-effort basis.

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## RPS Forms

The TOO section of the RPS target form has a summary table for all follow-up observations. The instrument configuration for the trigger observation is entered as the first target, and the summary table for follow-ups is completed. If all the follow-up observations had the same instrument configuration as the trigger target, no additional target forms would be needed. However, if the follow-ups have different configurations additional information is required. One target form is required for each unique instrument configuration. Each such unique instrumental configuration is referred to as a "target number" in the followup table, even though the observational target may be the same.

The sequence of observations described in this thread consists of 5 observations (one trigger plus 4 follow-ups) but only TWO different instrument configurations. Under these circumstances RPS requires only two target forms, even though there are a total of 5 observations. The first target form contains instrument information for the trigger observation and first follow-up and a fully completed follow-up summary table. The second target form gives the instrument set-up for the final 3 observations.

Follow-up observations count as constrained observations. The number and classification of constraints can be calculated using the "Constraints/Slewtax" tool, accessible from the RPS form. Note that additional constraints specified in the Remarks section cannot be evaluated by this tool, so any classifications should be taken as estimates.

## Parameter Details for Target 1

The key RPS field for setting up the trigger observation and the follow-up table are as follows:

- Set the **Total Observing Time** to be 80 ks. This is the integrated time for all observations (trigger plus follow-up)
- Set the flag **Is target position known or fixed?** to NO. This is required for a TOO where the target has not been identified in advance.
- Set the following parameters in the TOO section of the form:

**Is this the trigger target for a TOO?**

Yes, trigger target

**TOO response type:**

> 30 days

**Probability of TOO occurring in this cycle:** 0.1

**Exact CXC response window(days):** start=30  
stop=35

**Exact TOO trigger criteria:** We propose to trigger....  
*text truncated*

**If followups, time allocated for trigger target(ksec):** 5

**TOO followup instructions (1500 characters):** The trigger observation....  
*text truncated*

The follow-up table is filled out as follows. Please note that the "interval" parameter is the number of days from the previous observation, and the "interval tolerance" gives the range of acceptable days for the observation as a percentage of the interval. e.g. A time interval of 10 days with a tolerance of 20% translates to the required 8-12 day spacing. Finally, please note the last column of the table **Observation parameters specified by Target Number**. This column denotes the target number from which instrument and observing parameters are to be derived. The first follow-up has the same configuration as the trigger, so the relevant target form is number 1. Follow-ups 2-4 require another target form (target 2, not yet created).

| Follow-up | Observing Time | Time interval (days) | Tolerance(%) | Observation parameters specified by Target Number |
|-----------|----------------|----------------------|--------------|---|
| 1         | 5              | 20                   | 25           | 1   |
| 2         | 10             | 10                   | 20           | 2   |
| 3         | 20             | 10                   | 20           | 2   |
| 4         | 40             | 10                   | 20           | 2   |

Instrumental parameters are given in the [full RPS form](#), but not described in detail here. To alert Chandra schedulers to the fact that near-simultaneous radio observations are desirable, the RPS flag **Must this observation be coordinated with that of another space-based observatory?** should be set to "yes, constraint" and "VLA" specified in the **Observatories** box. This is true even though this is a joint proposal, and the VLA time was awarded through the Chandra Time Allocation Committee.

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## Parameter Details for Target 2

The first step in creating a target form for follow-ups 2-4 is to "clone" the form for target 1. At the top or bottom of the RPS form hit the **Add Target** button to bring up the adding/cloning tool. Specify one clone of target 1 and hit **OK**. Target 2 will appear at the end of the RPS form. This can then be edited to change the instrument set-up (remove the grating etc). These changes are not described in detail here, but appear in the [complete RPS forms](#). In addition to instrument changes, the following edits must be made to set up the target as a "follow-up":

- Set the **Total Observing Time** to be 0 ks. This is required since the total observing time has been entered in the form for target 1
- Set the flag **Is target position known or fixed?** to NO. This is required for a TOO where the target has not been identified in advance.
- The flag **Is this the trigger target for a TOO?** should be set to "No, Follow-up target".
- **ALL OTHER FIELDS IN THE TOO SECTION SHOULD BE BLANK or NULL**. For example, the **TOO response type** should be NULL (no value). There should be no text entered into any of the text boxes.

## Completed RPS forms

|   |
|---|
| FULL COMPLETED RPS FORMS FOR THIS THREAD: |
|---|

|                      |
|----------------------|
| <a href="#">HTML</a> |
|----------------------|

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## History

15 Jan 2005 Initial Version

15 Dec 2005 Updated for Cycle 8

15 Dec 2006 Updated for Cycle 9

21 Dec 2007 Updated for Cycle 10

15 Dec 2008 Updated for Cycle 11

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URL: <http://exc.harvard.edu/pog/threads/TOO/>

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