

Astronomer's Proposal Tools (APT) Concept of Operations

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Concept of Operations

The goal of the APT project is to improve the proposal preparation process, in order to provide users with a more intuitive, visual, and interactive experience by means of state of the art technology. The APT will be a complete and integrated system for the Hubble Space Telescope (HST) proposal preparation, replacing the current systems used for HST proposal preparation.

The APT is based on the prototype Scientist's Expert Assistant (SEA), developed at the Advanced Architectures and Automation Branch of Goddard Space Flight Center. A major aim of the SEA project is to explore how some state of the art tools can be used by many observatories. More information about the SEA is available on the web at <http://aaaprod.gsfc.nasa.gov/SEA/>.

The HST proposal process consists of two phases. In Phase 1, astronomers provide scientific motivation and enough detail about the proposed observations that the feasibility can be assessed and the requested amount of telescope time can be justified. Successful Phase 1 proposers then must provide a Phase 2 proposal. A Phase 2 proposal contains a complete specification of the observations which when processed allows the observations to execute autonomously onboard the telescope. Both of these tasks require software support to help the user meet scientific and technical goals, and provide feedback on what has been requested.

The APT will provide capabilities for developing a new Phase 1 proposal and for turning the Phase 1 proposal into a complete Phase 2 proposal (without reentering information). Most HST proposers will use the APT in the months before the annual Phase 1 deadline. Successful proposers will use APT again to prepare their Phase 2 before that deadline. But they may also need to make changes to their Phase 2 proposals through the APT after their proposal has been submitted (as a result of new information about the telescope or the target).

Apart from HST proposers, the APT will be used by support staff at the Space Telescope Science Institute. This includes data analysts and contact scientists preparing calibration proposals, engineers preparing engineering proposals, and program coordinators and contact scientists assisting proposers in using the APT and interpreting the results. This work can occur throughout the year.

The APT will consist of a suite of tools that share information. Some of these tools will be graphical and provide a high level of user interaction. Users will be able to visually explore various options for their proposals and weigh the scientific tradeoffs. For example, a user working with the Visual Target Tuner tool will view an instrument's aperture displayed against an image of the sky, and center the object of interest in the aperture. The user would also be able to rotate the aperture and determine the necessary orientation. The user would then apply the information from these explorations to a proposal.

Users with large proposals may wish to bypass visual tools. They will be able to use the proposal editors (spreadsheet and form editors) to enter and modify information in a tabular and textual format.

All the tools in APT will share proposal information. Proposal changes made by one tool will be automatically available to any other tool. Users will not need to enter the same data in multiple tools.

The tools will allow users to create, delete, and modify proposal objects (targets, patterns, visits, and exposures). They will also be able to transfer information across proposals. Common graphical editing techniques such as cut-and-paste of objects will be available.

APT's interactive tools will include:

- Proposal description editor will provide users with a means of supplying descriptive information about the proposal, such as investigator names, proposal abstract, etc.
- Spreadsheet editors of the proposal will provide a complete tabular view of the main proposal objects. They will also allow users to manipulate the view and change values. There will be a separate spreadsheet editor for targets, patterns, visits, and exposures.
- Visual Target Tuner will allow users to view and manipulate instrument apertures against an image of the target. This tool will also provide the following functionality:
 - Archival Research Tool will allow users to display information about observations from the HST data archive and perform duplication checks.
 - Bright Object Checker will determine whether there are bright object concerns for an exposure that could affect science or instrument health and safety, and display the concerns to the user.
- Exposure Time Calculator will determine the exposure time for a selected exposure or determine the S/N expected for a particular exposure time.
- Orbit Planner will model the layout of exposures within target visibility periods, display the results graphically, and allow for graphical tweaking of the orbit by operations such as copying, lengthening, moving, and deleting exposures.
- Visit Planner will allow graphical specification of visit dependencies (such as Visit 1 After Visit 2), and then display possible scheduling times based on all the constraints.

Some of the tools will work in a batch, rather than interactive mode. Batch tools will operate on the proposal as a whole (or at least on whole visits), with little user interaction. The batch tools are listed below:

- The Global Checker tool will carry out a series of proposal checks and report problems to the user, similar to the current processing in RPS2. The checks include:
 - consistency across proposal objects (were all the targets used?)
 - feasibility
 - schedulability (including guide star availability)
 - bright object checks (This is only a required check for cases where health and safety issues are involved e.g., STIS MAMAs).

Users must successfully run this tool before submitting their proposals. The tool will generate a graphical report on the proposal, like the current Description Generator in RPS2.

- Proposal Submission Tool will submit the proposal to STScI. It will check that the Global Checker was successfully run before allowing submission to proceed.

GO Use Case

This is a typical APT use case for a general observer (GO):

1. GO downloads the latest version of the APT from the web.
2. GO starts the APT and selects the Phase 1 mode.
3. GO creates a new proposal.
4. GO enters interactive tools and applies results from the tools to the proposal under development.
5. GO runs Global Checker on the proposal.
6. GO corrects problems by re-entering interactive tools, or using spread sheet editors.
7. GO runs the APT report generator to obtain a proposal summary.
8. GO saves the proposal and sends it to collaborators by email.
9. Collaborators can review the summary and send comments back, or load the proposal into their copy of the APT, inspect its contents in the interactive tools. They may make changes to the proposal which they email to others for further discussion.
10. GO finalizes proposal, runs the Global Checker, and then runs the proposal submission tool.
11. If the proposal is accepted, the GO starts to prepare Phase 2 version of proposal. (A new version of APT may need to be downloaded.)
12. GO starts the APT and selects the Phase 2 mode.
13. GO loads Phase 1 proposal and begins updating and checking information for Phase 2 using interactive tools and/or spread sheet editors.
14. GO continues as in steps 5-10 above.