Spitzer Space Telescope proposal process

S. Laine[a*], N. A. Silbermann[a], L. M. Rebull[a], L. J. Storrie-Lombardi[a]
[a]Spitzer Science Center, Mail Code 220-6, Caltech, Pasadena, CA, USA 91125

ABSTRACT

This paper discusses the Spitzer Space Telescope General Observer proposal process. Proposals, consisting of the scientific justification, basic contact information for the observer, and observation requests, are submitted electronically using a client-server Java package called Spot. The Spitzer Science Center (SSC) uses a one-phase proposal submission process, meaning that fully-planned observations are submitted for most proposals at the time of submission, not months after acceptance. Ample documentation and tools are available to the observers on SSC web pages to support the preparation of proposals, including an email-based Helpdesk. Upon submission proposals are immediately ingested into a database which can be queried at the SSC for program information, statistics, etc. at any time. Large proposals are checked for technical feasibility and all proposals are checked against duplicates of already approved observations. Output from these tasks is made available to the Time Allocation Committee (TAC) members. At the review meeting, web-based software is used to record reviewer comments and keep track of the voted scores. After the meeting, another Java-based web tool, Griffin, is used to track the approved programs as they go through technical reviews, duplication checks and minor modifications before the observations are released for scheduling. In addition to detailing the proposal process, lessons learned from the first two General Observer proposal calls are discussed.

Keywords: Proposal management, observation planning

1. INTRODUCTION

Observing time is available to investigators worldwide on NASA's final Great Observatory, the Spitzer Space Telescope (formerly known as the Space Infrared Telescope Facility). Once a year the Spitzer Science Center (SSC), which conducts the daily scientific operations of the Spitzer Space Telescope, announces a Call for Proposals to solicit General Observer, Archival Research, and Theoretical Research proposals. Currently we are deep into the proposal process for Cycle-3, the fourth opportunity for General Observers. The Spitzer Space Telescope is expected to remain fully operational in its cryogenic mission for an additional three years, until the spring of 2009, and we expect to announce at least two more full-cycle Calls for Proposals. In this paper we primarily discuss the General Observer proposal process. Before the observatory was launched and became operational in August 2003, 20% of the initial 2.5 years of observing time was allocated to the Guaranteed Time Observers (GTOs), comprising the three science instrument principle investigators, and the Science Working Group, consisting of astronomers who were active in planning the scientific requirements of the Spitzer Space Telescope. A Legacy Science Call for Proposals, the first General Observer call, was issued prior to launch, and time was awarded to six Legacy Science projects. These observations comprised more than 50% of the initial year of observing.

The SSC, based at the California Institute of Technology, has opted to use a one-phase proposal process: the scientific justification for the telescope time and the detailed observational parameters needed to successfully execute the observations are submitted at the time of proposal submission. This is different from other space-based observatories, which require the submission of the detailed observing parameters only after a program has been accepted. Our decision to use a one-phase process provides for a shorter turnaround time between the proposal submission deadline and the start of execution of the observations, which is crucial for our limited lifetime mission. To support observation planning, the SSC provides a large variety of on-line documentation and software. The SSC also operates an electronic Helpdesk where questions about observation planning are answered by email.

The proposal submission itself is performed with a Java-based client-server software tool called Spot. Spot enables observers to prepare detailed observations, called Astronomical Observation Requests (AORs). Spot's Proposal Tool allows the user to submit the scientific justification for the proposals (as a PDF file), along with the basic contact

* seppo@ipac.caltech.edu; phone 1 626 395-5727; fax 1 626 568-0673; ssc.spitzer.caltech.edu

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information for the observers (the coversheet), and AORs. After the proposal deadline, the SSC Community Affairs and Science User Support teams (CAT and SUST) print proposals, sort the proposals into panels, perform technical feasibility reviews of the proposals requesting a large amount of observing time, and check for duplicating observation requests, both against existing observations and among the new requests. For one week in late April, the Time Allocation Committee (TAC) meets in Pasadena to rank and evaluate the proposals, and to recommend to the SSC Director which proposals should be approved. After the TAC the SSC performs a more careful duplication check and a quick technical review of the smaller accepted proposals. The observers are contacted about any duplicate observations and any major technical flaws in their proposed observations. Our experience indicates that a significant fraction of observing requests are ready for execution as submitted, and no further changes are needed.

In the following sections we will discuss the various steps in the proposal process in more detail.

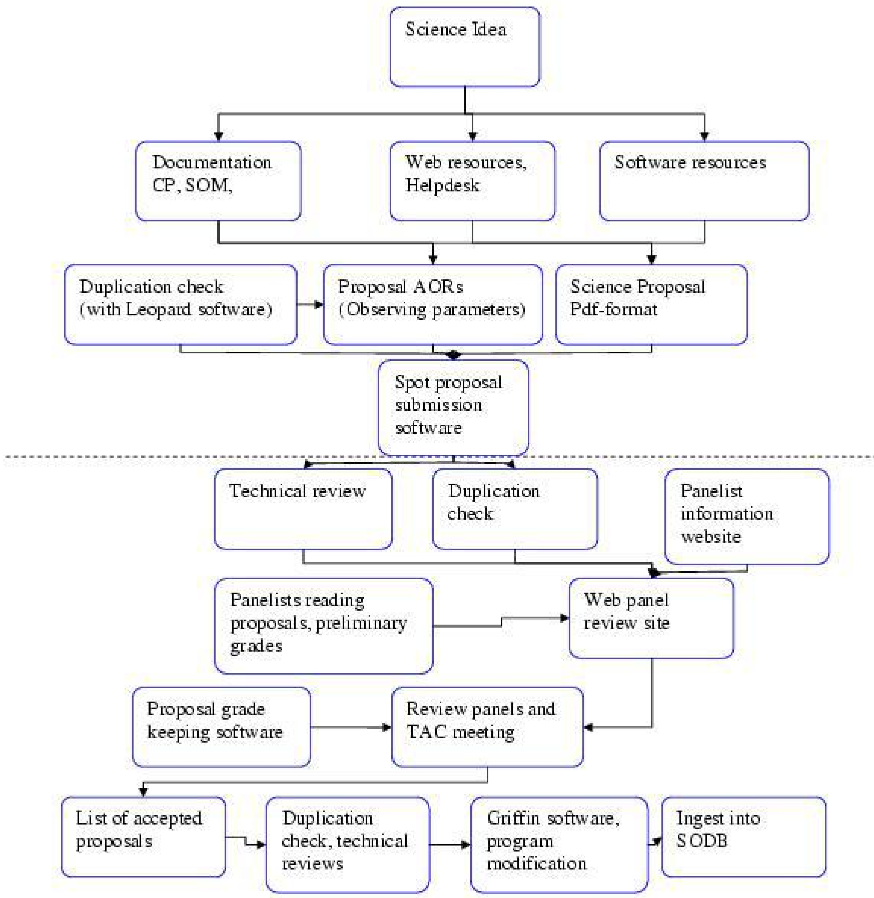

Fig.1. A flow chart showing the path of a science idea to a Spitzer proposal, the checks and evaluations of the proposal, and after acceptance the path to the Science Observations Database from where the observations are scheduled. The dashed horizontal line divides the proposal process into observer tasks (above the line) and SSC tasks (below the line).

2. DOCUMENTATION AND TOOLS

Documents that assist the potential observer in proposal planning are available from the SSC website, http://ssc.spitzer.caltech.edu/. The most important documents are the Spitzer Observer's Manual (SOM) and the Call for Proposals (CP). The SOM gives an overall summary of the capabilities of the observatory, and then discusses in detail the design, operation and capabilities of each science instrument. It also provides examples of Astronomical Observation Requests or AORs and "best practices," or the best observational strategies for different kinds of targets and different observing modes. The CP gives general information on the different categories of proposals that are allowed (General Observer, Guaranteed Time Observer, Legacy General Observer, Archival Research and Theoretical Research), the types of proposed observations (multi-cycle, targets of opportunity, second-look, generic targets). The CP also specifies the information that must be given in the proposal, together with format and page limits. The CP includes a copy of the Observing Rules, guidelines on NASA funding for accepted proposals, an overview of the proposal review process, and, finally, the criteria used to judge the merit of the submitted proposals and select the winning proposals.

More examples of observation planning are provided in the Observation Planning Cookbook, which discusses several different possible observations with the various observing modes for each of the three instruments, Infrared Array Camera (IRAC), Infrared Spectrograph (IRS) and Multiband Imaging Photometer for Spitzer (MIPS). The Cookbook also includes a section that discusses the proposal submission process itself.

The Spot User's Guide is the document that helps the user to get the most out of Spot, the tool used to plan Spitzer observations and submit proposals. Spot will be discussed in more detail in Section 4.

A large selection of online documents, in HTML and/or in PDF format, is available from the SSC website. The documents most relevant to observation planning are grouped together under the Proposal Kit section of the SSC web pages (http://ssc.spitzer.caltech.edu/propkit/). The Proposal Kit also includes information on the user-imposed and telescope-imposed constraints, infrared background, descriptions of the observation templates, and special tips for Solar System observers, among many other things; there are also links to other useful and related resources.

The most useful observation planning software tool, next to Spot, is the Performance Estimation Tool, or PET. The PET is actually a collection of Javascript-based web software tools that run in the user's internet browser to estimate the flux of targets at given wavelengths and to calculate the sensitivity of Spitzer with various integration times and observation configurations. This is essential for determining how much on-source time is needed to get a desired signal-to-noise ratio for an observation.

Lastly, there are several ways to check which objects or parts of sky have already been observed, or are planned to be, with Spitzer. The Spot software tool, discussed in more detail below, allows one to perform a simple search for any observations in approved programs within a certain radius of specified sky coordinates. Leopard, the Spitzer Archive Interface tool, is the tool that observers usually use to retrieve data, so it provides more sophisticated search options than Spot for locating existing (or planned) observations, such as searching for just one observing mode, or searching over a larger radius.

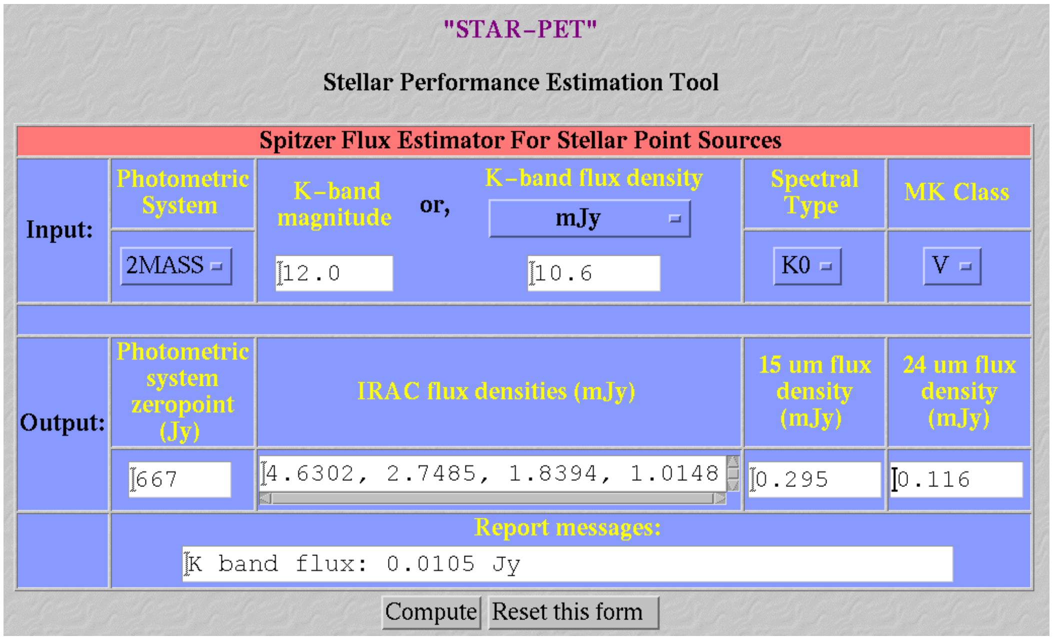

Fig. 2. STAR-PET, one of the software tools in the PET package, used to estimate the flux levels of a star at the IRAC instrument observing wavelengths and at 15 and 24 microns, observable with the IRS and MIPS instruments.

3. HELPDESK

The Science User Support (SUS) team at the SSC operates the Spitzer Helpdesk at help@spitzer.caltech.edu. Questions about anything related to the Spitzer mission come into this email address. Usually the incoming questions, or “tickets,” are answered within two working days, and in many instances within a few hours of submission. A Helpdesk operator assigns the incoming ticket to a member of the SUS team, who then replies to the ticket, after possibly consulting with the relevant experts, such as the Instrument Support Team (IST) members at the SSC. Prior to the Spitzer proposal deadline in February the SSC receives hundreds of inquiries about observation planning or requests for clarification of information in the Call for Proposals. The SSC is able to help with questions relating to technical issues, or in some cases, the best observing strategy, but scientific advice is not given by the SSC. The Helpdesk is also used to communicate with the observers who are awarded Spitzer observing time, after the proposal panel review process is complete.

The Helpdesk at the SSC currently uses a commercial Helpdesk software package designed by Applied Innovation Management (AIM). This provides SSC staff a web interface to the assignment and closing (replying) of the incoming tickets. The Helpdesk also has simple tools for providing statistics on the incoming tickets, and a database that can be queried to obtain information in closed tickets.

4. SPOT

The essential software package for planning Spitzer observations is Spitzer Pride, which contains both Spot and Leopard. Spot and Leopard are Java-based client-server GUI tools and are available for download from the SSC web pages for UNIX, Linux, Windows, and Mac operating systems. Spot is used to create Astronomical Observation Requests, and with its Proposal Tool to submit proposals to the SSC. Anyone who plans to submit a Spitzer proposal needs to download and install Spitzer Pride.

Spot provides the interface to the eight different Astronomical Observation Templates (AOTs). There is one template for the IRAC instrument, three for the IRS (staring spectroscopy, mapping spectroscopy, peak-up array imaging), and four for MIPS (photometry, scan mapping, spectral energy distribution and total power). The observer specifies his/her targets in a target list, providing their coordinates or NAIF ids (for Solar System targets). Target coordinates may be specified in Equatorial, Ecliptic or Galactic coordinate systems. After that the proposer selects the observing template that matches the type of observations that he/she needs. An example of one of the templates is given in Fig. 3. The observer specifies the integration time and the number of cycles for these observations, dither patterns if needed, and the mapping parameters. The interface provides a finite number of fixed parameters, and is intended to be simple enough for a quick and robust specification of the observing parameters, while providing the ability to specify nearly any kind of an observation. The combination of a specified target and completed Astronomical Observation Template creates an Astronomical Observation Request.

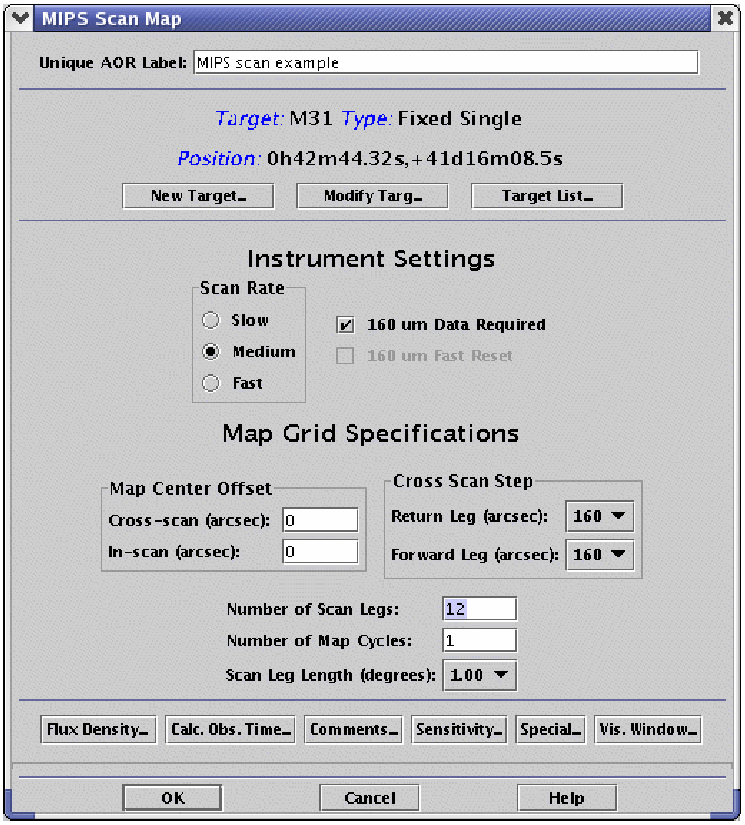

Fig.3. Example of an observation template for MIPS Scan mapping. The observer specifies the scan rate, cross scan steps, number of scan legs and number of mapping cycles, together with the scan length.

Spot has a powerful capability to visualize the observation as it would execute onboard Spitzer. A background image from one of the various image servers can be loaded into Spot directly, or the observer may use his/her favorite FITS image of the target. Spot can then overlay the Spitzer observation to "visualize" it, or it can show the instrument aperture(s) overlaid on the astronomical image of the target. The user can run an animation of the observation that shows the entire observing sequence. In this way the observer can confirm that the observation will cover the object as intended. Spot also allows the user to find the dates when the target is visible to Spitzer, and to visualize the observations on any given date during the target's visibility period. Figure 4 shows an example of the visualization of a MIPS scan map observation.

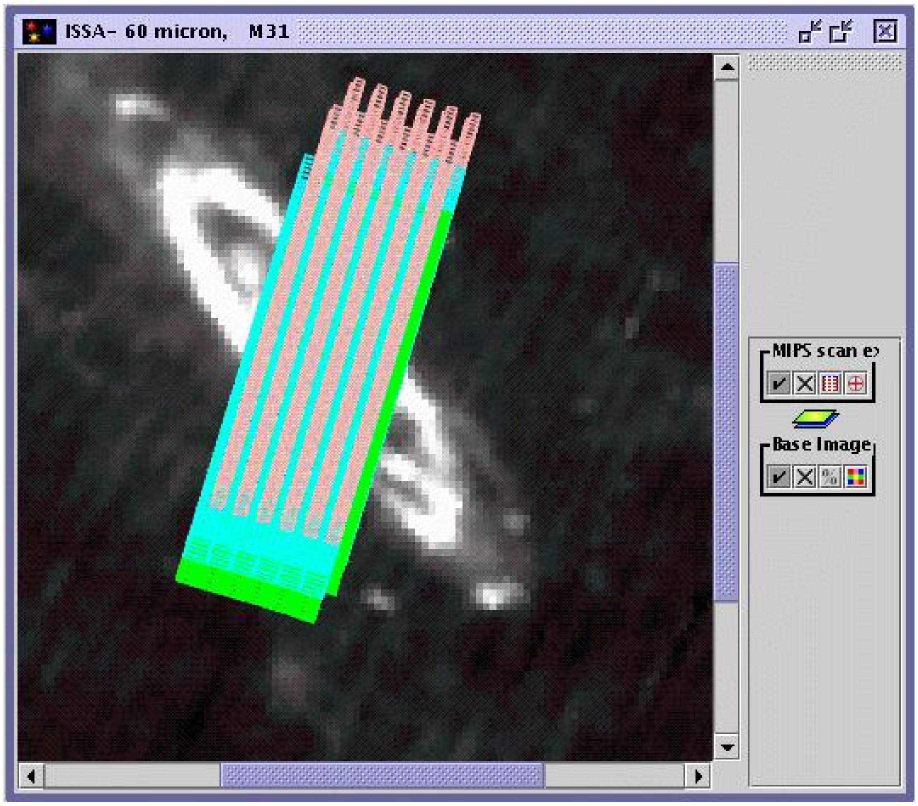

Fig. 3. An example of the visualization of a MIPS Scan map observation. The different colors correspond to the three different wavelength bands of the MIPS instrument. The mapped object is partly seen in the background.

Spot provides several other capabilities as well. The user may overlay objects from a catalog on an image, measure distances across an image, and download existing AORs and visualize them together with the new, planned observation. It is possible to estimate background levels, set observational constraints, calculate the actual total time of observation with overheads (to be included in the proposal), show the positions of bright objects (moving or inertial) near the planned observation, and visualize the depth of coverage of the planned observation.

Spot's Proposal Tool is used to actually submit the proposal. The proposal consists of three parts. The first part is the coversheet. The coversheet includes basic information about the observer, as well as the proposal title and abstract, and the proposal category (General Observer, Legacy, etc.). The second part is a PDF file that provides the scientific and technical justification for the proposal. This must be prepared using MS Word or Latex templates downloaded from the Proposal Kit web page. The user must create the final PDF file and then point Spot's Proposal Tool to the file's location on disk. Spot will grab the file from that location when submitting the proposal. The final part of the proposal is the set of AORs which have been created using Spot (proposals for archival or theoretical research do not have AORs). Once a proposal has been submitted to the SSC using Spot, it may be updated as often as desired up to the proposal deadline using the username and password that the proposer chose at the time of the first submission.

Upon submission of a proposal, the coversheet information and the AORs are deposited into a "proposal database" at the SSC. The PDF file is deposited onto a hard disk at the SSC. After the proposal deadline, the CAT queries the database to obtain information about the submitted proposals and AORs. The PDF files are checked for printing problems. If there are problems with printing the PDF files, the proposers are contacted via the Helpdesk and asked to correct the problems and to send a revised PDF file. This updated file is checked to ensure that the proposal has not been altered in any other way and that it prints successfully. The proposal PDF files are also checked for duplications (i.e., accidental submissions of the same proposal more than once) and for other gross errors.

5. AFTER THE DEADLINE: DUPLICATION CHECKING AND TECHNICAL REVIEWS

After the proposal deadline, the SSC performs a technical review of the larger proposals, meaning those which requested 50 or more hours of observing time, and the proposed Target of Opportunity observations, as well as any other proposals requested by review panel members. The SUST and the IST members read the proposals to determine if the proposed observations are technically feasible. Areas examined include the use of constraints, the observing strategy, and the feasibility of achieving scientifically useful data. Technical feasibility reports are written for the larger proposals, and made available to the proposal review panels to assist them in evaluating the proposals. The technical feasibility review of the smaller observing proposals (< 50 hours) is done after the TAC has met and only for those proposals that were recommended to be approved. This is briefly discussed below and under Section 7.

Before the TAC meets, the SUST members also perform a duplication check to determine whether the proposed observations duplicate existing observations, or other proposed observations. This information is used by the TAC to guide them in cases of significant overlap of proposed observations. Currently the SSC is testing a new method of duplication checks. For Cycle-3 we are running both the old and the new duplication check software to evaluate the performance of the new software. The older software is a straightforward PERL script that searches for any other observations within a given radius of a specified observation. The observing modes and wavelengths requested are matched, so that only similar observations are flagged as potentially duplicating. The newer software package is Java-based and queries the database for target coordinates and observation parameters, and divides the sky into "tiles" of about 1 arcminute x 1 arcminute in size, and then finds which sky tiles a given observation will cover. Another C program then goes through the collection of these sky tiles, compares them between AORs, and finds the overlapping sky tiles, or potentially duplicating observations. Before the proposal review meeting, the SUST identifies the most flagrant duplications and makes this information available to the TAC.

After the TAC meeting a more thorough duplication check is performed on all approved proposals. The duplication check software is run on the approved proposals and existing programs. Observations that are found to duplicate an existing program's AOR(s) or higher-ranked approved proposals are reviewed and removed, or approved for execution on a case-by-case basis. In the cases where duplications are approved, the duplicating data from the new program may be embargoed from release to the new observer until the proprietary period of the existing observation has expired.

Since only potential duplications (with respect to the spatial coordinates) are identified by the duplication checking software, and due to the uncertainty in the roll angle of an observation until it is scheduled, there must be a manual checking process to determine whether the potential duplications are real duplications. The Observing Rules provide guidelines on what are considered duplications. Generally, if at least 25% of either observation is covered by the other observation, and the integration times are within a factor of 9 (sensitivity within a factor of three), and the same or comparable observing modes are used, the observations are considered to be duplicates. Spot and Leopard are invaluable tools for visualizing the observation and checking for duplications. This final duplication check of the approved proposals is the most work-intensive part of the proposal handling process by the SUST members.

Finally, in preparation for the TAC meeting (see next section), the SSC groups the proposals into scientific categories after the proposal submission deadline. The categories correspond roughly to high redshift Universe (3 parallel panels), nearby galaxies and groups of galaxies (2 parallel panels), star formation, interstellar medium and evolved stars (3 parallel panels), circumstellar disks and brown dwarfs (2 parallel panels) and solar system objects (1 panel). Parallel panels allow us to assign proposals authored by any of the panel reviewers to a parallel panel.

6. TIME ALLOCATION COMMITTEE (TAC)

The planning for the TAC meeting starts in October (the Call for Proposals is issued in early November) when the Director and the Assistant Director for Community Affairs begin inviting astronomers to serve on the review committee. Reviewers are selected from professional astronomers who have familiarity with the science that is pursued with Spitzer observations. The reviewers represent a wide variety of scientific interests. Astronomers who have already obtained Spitzer time may well become reviewers in the subsequent proposal cycles. No SSC personnel are allowed to serve on the TAC.

The proposal review meeting has two parts. In the first, the whole body of reviewers is split into multiple review panels, seven to nine members in each, whose task is to evaluate and rank the 40-80 proposals assigned to that panel, and to provide constructive comments that can be forwarded to the proposers by the SSC. Each reviewer is assigned primary or secondary review responsibility for 15-20 proposals in their panel. However, all reviewers are required to read all the proposals in their panel. Both primary and secondary reviewers provide written comments about their assigned proposals during the review, with the primary reviewer drafting a summary of comments for a given proposal. Each panel has a chair, a senior astronomer who guides the discussion of proposals in the panel. A deputy chair assists the panel chair and is responsible reviewing and finalizing the panel's comments.

We use two kinds of information in order to assign proposals to reviewers. Upon accepting their invitation, the reviewers provide the level of their expertise in the scientific categories of the proposals, and we attempt to match their expertise with the scientific category of the proposals when assigning proposals. We run an SSC-written PERL program to find conflicts of interest between the reviewers and investigators on the proposals. Conflicts can be due to the same institutional affiliation, previous collaborations, or even family ties. Competing proposals on the same topic or science can also be viewed as a conflict. The assignments are made so that 1) conflicts are avoided and 2) the scientific category of the proposal is aligned with the expertise of the primary and secondary reviewer. The assignments are balanced so that everyone in the panel (apart from the panel chair) gets an approximately equal load of proposals to review as the primary or secondary reviewer. The goal is to flag obvious cases of conflict, though in practice the automated checking cannot catch everything. The reviewers can (and do) inform us of conflicts once they receive the proposal assignments. We reassign proposals as necessary.

The proposal review material, including instructions for performing the review, review assignments, and instructions for using the proposal review website, together with required review website access usernames and passwords and any requested hardcopies of the proposals, are sent to the reviewers by FedEx mail about a month before the TAC meets. Pages on the proposal review site are created by an SSC-written PERL-based software program. The reviewers log into this website to submit their preliminary grades and comments for the proposals before the TAC convenes in Pasadena in late April.

The technical reviews (see section 5 above) are also posted on the proposal review website together with the proposals and AORs, so that all of this material is available to the reviewers. The SSC prepares for the TAC meeting by arranging for the computer network, projectors, printers, and rented laptops at the meeting site (a local hotel). The SSC also prepares an SSC-written HTML-based online panel scoring software package that is used to record the individual votes on proposals, backup Excel grade recording sheets (to be used in case of catastrophic network failure or internet worms), and a large amount of other supporting documents for the reviewers and the SUST personnel who act as panel facilitators that record grades and provide immediate technical support at the review meeting. The SSC administrative personnel help the reviewers with their travel arrangements to Pasadena. The SSC has recently adopted software written by the Chandra X-Ray Observatory Science Center personnel to gather the required travel information from the reviewers.

During the weekend before the review meeting begins, CAT members, together with IPAC computer support group, meet at the review site to set up the computer connections, projectors and printers for the meeting.

The TAC meeting begins with a plenary session for all the reviewers where the review process is discussed. The reviewers then break into panels and meet in their respective panel rooms, together with a SUST panel facilitator, one in each panel. All panelists have a laptop, and connect to the internet by a DHCP-operating network. The facilitator also has a laptop. The panels are expected to triage (i.e., exclude from further consideration) the proposals that received the lowest preliminary grades. Any such proposal may be resurrected at this phase if any of the panel members feels strongly that the proposal was unfairly triaged out. The panel then starts discussing the remaining proposals one by one, and at the end of the discussion will vote by secret ballot on the proposal. The facilitator collects the voting slips and records the grades, and the process continues until all the proposals have been discussed and voted on. The panel facilitator can provide information of the average grades of the voted proposals at any stage of the process, whenever requested. Finally, all the proposals are assigned a rank, according to their average grade, and the panel discusses the ranked order, keeping in mind the allocation of observing hours given to the panel and the variety of science that the panel covers. The panel may choose to switch the ranked order of some proposals at this stage. The final product from the panel is a rank-ordered list of proposals, together with comments for each proposal in the panel. The primary reviewers are in charge of writing the comments for their proposals, and the deputy chairs do the final editing of the comments.

The final two days of the TAC meeting involve only the panel chairs and the TAC Chair. It is the duty of this smaller group to finalize the recommended list of small GO, Archival, and Theoretical proposals, and to decide which of the larger proposals (those with a time request over 50 hours, including both GO and Legacy category proposals) should be recommended for execution. The panels in the earlier stage recommend which GO and Legacy proposals with a request over 50 hours should be further considered by the TAC. This smaller group during the last two days also checks on the final accounting of hours and money – if one panel has undersubscribed their allotment, another panel may be allowed to oversubscribe. At the end of the process the TAC gives the final list of recommended proposals to the Director of the SSC who is the formal selection official. The recommendations of the TAC are usually accepted without modification except for those found after the review to significantly duplicate another approved proposal or to be technically infeasible to schedule.

7. PROGRAM INGEST

After the TAC the SSC starts the process of proposal (now an approved "program") checking, and the eventual ingest of the approved proposals into the SSC Science Operations Database. First, we check significantly duplicated proposals to see if any can be rejected due to identical observations existing in the set of already-approved observations or in higher ranked approved proposals. After that, the reviewer comments are checked and then sent off to the proposers. The SSC has developed software to email the proposers about the acceptance or rejection of their proposals, together with the panel comments. We aim to complete this process no later than approximately two weeks after the TAC meeting.

SUST members perform a technical review and a duplication check of the accepted proposals (as discussed above), and correspond with the observers if problems are found, to obtain a new, corrected set of AORs, free of any duplications. The Helpdesk is used to communicate with the observers. This iterative process usually takes a few months and involves considerable communication between many different people at the SSC. To assist with this process, the SSC has developed a web-based Javascript software package called Griffin, which organizes the technical reviews, proposal material, duplication checking material, email addresses of the observers, and all the email communications into an easily manageable browser-based interface. The final accepted AORs are then loaded into the Science Operations Database and released into the scheduling pool.

8. LESSONS LEARNED

The one-phase proposal process has been a partial success. While over 50% of the programs do not initially need or request changes, we found that only approximately 40% of all accepted Cycle-2 GO programs did not require changes. The SSC does not try to optimize AORs, although the SSC recommends changes that will produce better quality data. Therefore, we conclude that while the one-phase proposal process is not an unqualified success story, it does allow many programs to be quickly ingested scheduled for observations. We have also noticed an improvement in the quality of AORs between Cycle-1 and Cycle-2, and we expect to see further improvement in Cycle-3.

The visualization capabilities of Spot have been an unqualified success, and several astronomers have even begun to use Spot's visualization tools to help with their science analysis, to make figures for inclusion in their science posters and papers, and to plan observations beyond Spitzer. Other missions, such as Herschel, are adopting Spot for their own use.

Our Helpdesk software has suffered somewhat from the difficulty in obtaining fast and expert support from the vendor when problems arise. Learning the workings of the software took a considerable amount of time and effort. We also noticed that during periods of high traffic some emails never made it into the software to be tagged as tickets. This was traced to some emails, usually spam that either had unusual contents or attachments. This has become more problematic over the past year as our volume of Helpdesk traffic increases. We do have a backup email account which we access (with the e-mail program Pine) to check for incoming tickets that were not ingested into the Helpdesk software. Another issue with our Helpdesk is that routine access to the tickets appears to have slowed down considerably as the total number of tickets it holds in its database has increased. New Helpdesk software is strongly desired and we will investigate the options over the next several months.

The SSC website has received praise for its organization, as well as criticism for the difficulty in finding things. We have included multiple links from multiple locations, as well as a search function, to make it easier to locate information.

The panel review website has been successful, but extracting information about the reviews and final grades has turned out to be difficult. In the future we are planning to move to a database system from which the needed information can be easily queried and the final comments e-mailed directly to the proposers.

Supporting the TAC meetings has been an interesting challenge. During our first year we were unfortunate enough to hold the TAC meeting during the same week that a new worm affecting Microsoft-based systems was unleashed into the internet. Unfortunately, our rented laptops (which had Microsoft operating systems), as well as several laptops owned by reviewers, did not have the latest security patches. Several of the laptops were infected with the worm and it took several hours to track them all down. For subsequent cycles our rented laptops have the most recent virus protection software, and we strongly recommend that our reviewers check that their own laptops have the most recent virus protection software installed.

We continue to learn how many printed copies of proposals at the TAC meeting are needed. During the first year we printed copies of all the proposals for all the reviewers, but it turned out that only about one printed copy per proposal was needed. In subsequent cycles we have had only one set of printed copies of all the small and about 14 copies of the medium and large proposals at the review meeting. We have printers in each panel room for printing any more copies that are needed. We also followed the example of other Great Observatories by providing CD-ROMs of the proposals to the reviewers, along with providing the option of having hardcopies sent to the reviewer if they so wish. Generally, less than 25% of our reviewers request hard copies. We have also learned that one laptop-connected projector per panel is usually enough for projecting the proposal rankings etc. in the panel rooms, but we do provide the old-fashioned "overhead" projectors to those panels which choose to use them.

Duplication checking has turned out to be one of the hardest problems and a very time-consuming task. The nature of a limited lifetime mission dictates that targets that have already been observed should not be observed to the same depth again, unless there is a strong scientific justification (e.g., time-series observations). However, potential duplications have so many variables, including the spatial position, instrument configuration (sometimes even cross instrument observations can be duplications, for example IRS peak-up imaging at 22 microns versus MIPS photometry at 24 microns), integration times per position on the sky, time variability observations, large surveys versus pointed observations, valid justifications for duplications in the proposals, etc., that it is difficult to avoid the need for manual and time-consuming duplication checking. One way to solve this problem (implemented by other observatories) is to give the task to the observers and just trust that the observers have made a careful job of checking for potential duplications. However, we have repeatedly found that some proposed observations are complete duplications of existing ones without any good justification. Therefore, we continue to make the manual duplication checks.

Performing program checking and program modification was done in an ad hoc way after the Cycle-1 TAC meeting. It was difficult to keep track of the status of programs undergoing modifications. The Griffin software has enormously helped with tracking in the program modification process. One can now also easily keep track of communication with observers and obtain statistics of the programs that are undergoing program modification or have been ingested into the database already.

This work was performed at the California Institute of Technology under contract to the National Aeronautics and Space Administration.