

## Overview

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The Spitzer Science Users Panel convened for its 17th meeting at the SSC on May 2/3, 2006 just a few days after the mission had passed the critical milestone of 2.5 years of science observations following in-orbit checkout. The fact that the Spitzer mission has been honored via the selection of Dr. Michael Werner to deliver the George Darwin lecture of the Royal Astronomical Society underscores the success realized during the first years of the mission.

Overall, many, if not most, facets of the SSC operation are performing remarkably well.

- The observatory continues to be scheduled at peak efficiency, populating a smoothly operating archive with data that observers can manipulate with an ever increasing suite of in-house and contributed post-BCD software.
- New capabilities, such as multi-hour IRS integrations, are being demonstrated and made available to users with commensurate expansion of scientific opportunity.
- The Cycle 3 call for proposals, proposal submission, and review have proceeded smoothly. The process dealt with the first round of GTO proposals effectively and user demand has increased to an oversubscription of nearly 4:1. The results of the Cycle 3 selection had not been announced at the time of the SUP meeting.
- Data workshops continue to produce enthusiastic responses from attendees.
- Working with a lean staff and limited resources the Spitzer public affairs office has produced a steady stream of press releases of consistently high quality. In recent months several have been picked up by the mainstream media as significant stories. Public affairs at SSC can be regarded as having equal stature with public affairs at the other great observatories.

At this meeting SSC announced a re-organization that would split the user support functions at SSC into ``community affairs'' and ``science user support''. This new structure reflects a natural division of effort and will lead to more efficiency overall. The SUP endorses this new structure.

## Specifics

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### 1) The declining SSC budget

The high standard of achievement at SSC is at risk given the trends in funding for the SSC. Recently the organization absorbed a 5% decrease in operating funds, which follows upon a similar recision the previous year. The organization has been resilient to these cuts, managing to maintain efficient observatory operations and a high level of user support thanks to the dedication and productivity of the remaining staff. SSC is an efficient close-knit team at this point and, being so lean, it is apparent to the committee that further cuts will impact on the ability of SSC to serve its community and thus make the most effective use of this Great Observatory during the limited time remaining in the cryogenic mission.

### 2) Responsiveness to the SUP

SSC presented a detailed response to previous SUP meeting report (#16). The SSC reply directly addressed all of the issues raised in the previous meeting. While being responsive, SSC made it clear that most of these actions are in progress and/or limited by available resources. As a result, some of the specific comments that follow are reiterations of issues raised in the previous SUP report. The committee appreciated the attention paid by SSC to the previous report and the candor in reporting the status of addressing the items.

### 3) Data Pipeline Caveats and Pending Improvements

- a) Data caveats - SSC has made an effort to respond to the SUP request for explicit advertisement of data anomalies by collecting reports of data quirks and caveats on their web pages. This organization is a good first step toward making an accessible structured listing of potential data quirks but falls short of the SUP's desire to put characterization of data anomalies at the user's ``fingertips''. The NICMOS (<http://www.stsci.edu/hst/nicmos/performance/anomalies>) and 2MASS ([http://www.ipac.caltech.edu/2mass/releases/allsky/doc/sec1\\_6b.html](http://www.ipac.caltech.edu/2mass/releases/allsky/doc/sec1_6b.html)) projects both maintain data caveat pages that provide examples of how such information can be organized in a readily accessible manner. The SUP urges SSC to continue to make this critical information as transparent to users as possible.

b) Pending pipeline improvements - The previous SUP report requested that SSC keep a user accessible listing of pending improvements to data pipelines. From the discussion at this meeting it is evident that such listings are kept internally by the pipeline teams, but this information is not yet readily accessible to the users. As discussed in the next item, access to this information is important to users planning their data reduction strategies.

#### 4) Data processing priorities

Not only should SSC maintain a list of open software issues that is accessible to users, it should make the priorities for addressing these issues apparent. This was a primary recommendation from the previous SUP report and we reiterate it here.

- a) Doing so enhances the planning process at SSC and guides resource allocation.
- b) Prioritizing pipeline modifications also sends a message to users as to the most critical shortcomings of the current pipelines while at the same time provides a means of anticipating the most likely near-term improvements.

#### 5) Pixel response functions (PRFs)

With the exceptional stability and overall performance of Spitzer now well established, there is an ever increasing need by the community to have well defined and highly accurate representations of the point response functions (PRFs) for each instrument. Three primary issues are of concern:

- a) Continued support of the STinyTIM simulation package. The SUP was informed that John Krist has indeed been retained for this effort. We are concerned that John is a single point failure (as he is for the HST version of TinyTIM from which the STinyTIM package was adapted).
- b) Updated PRFs, particularly for IRAC, but also for MIPS and the IRS. The SUP was informed that the IRAC PRF simulator developed by Bill Hoffmann has been improved and that the necessary description could be incorporated into STinyTIM. For the IRS, the point-source slit loss profiles are of great interest.
- c) The community also showed interest in the best available PRFs derived from real data. Of particular interest are PRFs

sampling a range of spectral slopes, which is important for matching observations on a diffraction limited system. Also, simple 1D radial profiles were desired (although these are easily made directly from the 2D images).

#### 6) CUBISM and IRS extended source slit mapping

As outlined in previous SUP reports, users are finding the reduction of extended source IRS data particularly difficult. At this meeting the SUP heard two reports which substantially address this issue. SPICE now has tools to better address extended source spectral extraction. Members of the SUP were also impressed with the versatility of the contributed CUBISM software. CUBISM promises to aid substantially in the reduction and analysis of IRS mapping of extended sources. In order to provide this vitally needed tool to the users as soon as possible the SUP suggests the following actions.

- 1) SSC provide a clear illustrated advertisement of the capabilities of CUBISM as soon as is feasible. Users need to see what they can accomplish with this software in order to plan the level of effort they might wish to invest with current tools prior to CUBISM's availability.
- 2) As soon as sufficient documentation can be developed, provide a "beta" version of CUBISM so that users can begin to train themselves in the operation of CUBISM and experiment with the data they have in hand.
- 3) Advertise a schedule for the availability of the items above as well as a formal release date for the operational version of the software.

#### 7) SPICE vs. SMART

Users remain confused about the IRS tools SPICE and SMART. Seen by some users as distinct alternatives these tools have complimentary functions. Although this may be obvious to many, many also remain baffled. Given the recent improvements in SPICE which permit ``optimal extraction'' of spectra and analysis of extended sources, it is even more true that SPICE can be viewed as a necessary front end to SMART analysis. SSC should aid users by explicitly describing how these tools can be used jointly to advantage.

#### 7) 160um optimization

The SUP feels that the continued refinement of the 160um pipeline and observing mode should be pursued vigorously. It was noted

that the 160um channel provides a crucial link between the mid-IR and the sub-millimeter and its importance and performance should not be compromised. The SUP was encouraged by reports that the MIPS IST is pursuing a revised observing strategy that will allow improved performance for faint objects.

#### 8) APEX validation

Although the SUP has agreed with SSC's desire not to deliver source extractions with BCD data, the previous SUP report stressed that the source extraction tools, nevertheless, needed proper characterization and validation. This software has been available to users for some time. At the next SUP meeting the panel would like to see a presentation of the status of APEX validation - which we understand is in progress. In the meantime the SUP urges SSC to provide as much source extraction validation information to users as possible - drawing particularly on and comparing with the datasets delivered by the Legacy teams for fiducial reference.

#### 9) Providing compiled versions of IDL dependent tools

There is some concern about the use of IDL as the primary language for software tools developed and distributed by the SSC, because of the high price for licensing, especially for non-academic entities. There was also some worry about longevity, but it was also noted that the IDL environment has existed for at least 20 years and is likely to continue. No obvious solution to the problem exists currently, as IDL is widely accepted by the astronomical community and is cross-platform.

The SUP recommends that the SSC look into distributing IDL programs as both code and as compiled runtime packages using the freely distributable IDL Virtual Machine. The latter eliminates the need for users to buy the entire IDL environment to run the SSC software.

#### 10) Extended mission planning

The SUP heard more detailed plans for an extended Spitzer mission which entails both mining of the archive as well as continuing observations in IRAC bands 1 and 2 following the exhaustion of cryogen. The scientific case for both aspects of this extended mission are compelling. The SUP will generate a letter of support expressing the Spitzer community's endorsement of the extended mission strategy, highlighting the cost effectiveness of both components of the extended mission.