PLANNING YOUR OBSERVATIONS WITH THE SPITZER SPACE TELESCOPE

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Abstract

The Spitzer Space Telescope (formerly SIRTF) was launched in August 2003. It has three science instruments: (1) the Infrared Array Camera (IRAC), which images at 3.6, 4.5, 5.8, and 8 microns; (2) the Infrared Spectrograph (IRS) with resolutions of ∼60 and ∼600, from ∼5 to ∼40 microns; and (3) the Multiband Imaging Photometer for Spitzer (MIPS), which images at 24, 70, and 160 microns. Early studies of stars, star formation, and the interstellar medium are already in press, and promise to provide a wealth of new and interesting results. The next call for proposals for Spitzer will be issued in Fall 2004, with proposals due in February 2005. You need to use a tool called SPOT to prepare your observations and submit your proposal. This paper provides a very quick overview of observation planning for your Spitzer observations! For more (and more recent) information, find us on the web at http://ssc.spitzer.caltech.edu/ .

Key words: Missions:Spitzer Space Telescope

1. What is Spitzer?

Spitzer (neé SIRTF) is the final element in NASA's Great Observatories Program. It was launched on 25 Aug 03. Spitzer has an 85 cm diameter f/12 lightweight beryllium telescope, cooled to ∼6 K. It is diffraction-limited at 5.5 μm, and has wavelength coverage from 3−180 μm. Its estimated lifetime (limited by cryogens) is 5 years. Spitzer has three instruments. IRAC (InfraRed Array Camera) images at 3.6, 4.5, 5.8, and 8 μm. IRS (InfraRed Spectrograph) provides $R \sim 64-128$ spectral resolution over 5.2-38.0 μm and $R \sim 600$ over 9.9-37.2 μm. MIPS (Multiband Imaging Photometer for Spitzer) images at 24, 70, and 160 μm and performs low-resolution (R=15−25) spectroscopy between 55 and 96 μm.

2. How can you get time and money?

Cycle-1 proposals were due in February; Cycle-1 General Observer (GO) observations are being scheduled now. The with the proposals due in February 2005. Cycle-2 is anticipated to include not only GOs, but also Archival Research (including all Legacy data taken and processed to that point) and a Theory Program. Funding for successful U.S.-based investigators is determined via algorithmic means, and will depend on the amount of observing time granted and/or the complexity of the analysis tasks. US-based Co-Is of a foreign-led proposal are still eligible for funding up to 50% of the work effort. Cycle-1 was (and Cycle-2 is expected to be) a ONE-PHASE PROPOSAL PROCESS, meaning that observers have to submit final observations (AORs) with their proposals. The program that observers use to create their observations is called SPOT, and SPOT is also the proposal submission tool. Observers design AORs, attach a PDF proposal justification, fill out the coversheet information, and submit the proposal all within SPOT.

3. Observing Modes

A Spitzer observation uses any of the set of 7 Astronomical Observing Templates (AOTs). Observers fill out AOTs using SPOT (Spitzer Planning Observation Tool). A filled-out AOT is an Astronomical Observing Request (AOR).

Five of the AOTs (IRAC Mapping, IRS Staring, IRS Spectral Mapping, MIPS photometry, and MIPS Scan Map) were commissioned during the first 100 days of the mission. An additional AOT, MIPS SED Mode, will be commissioned in Summer 2004, and a final AOT, MIPS Total Power Mode, will be commissioned in 2005.

4. MIPS Photometry

First, here is an example photometry observation of a source <1.′5. We determine from science requirements that we need 2 cycles of the basic dither pattern at 24 μm, 1 cycle at 70 μm at the default pixel scale, and 5 cycles at 160 μm. Figures 1 and 2 show the filled-out AOT front-end in SPOT, and a SPOT visualization of the resulting observation.

5. MIPS Scan

Here we design a medium scan rate, 1°×0.5° map, with

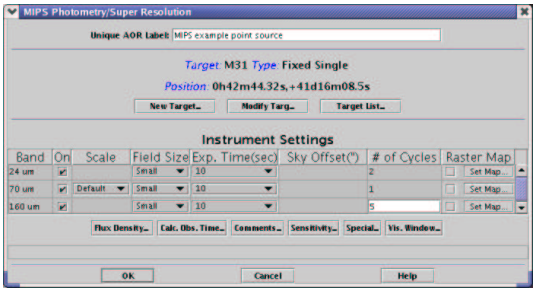

Figure 1. MIPS Photometry AOT

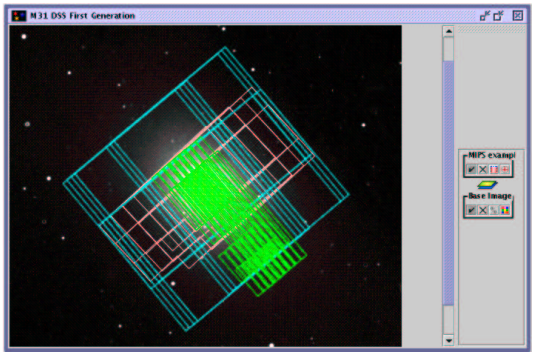

Figure 2. MIPS Photometry Visualization (blue=24, green=70, pink=160)

to obtain this map is very nearly 3 hours, which is the maximum time per AOR, so only one map cycle can be done per AOR. This AOR should be repeated at least once for best quality 160 μm data and asteroid rejection. Figures 3 and 4 show the filled-out AOT front-end in SPOT and a SPOT visualization of this observation.

6. IRAC Map

Next is the IRAC map that produced the IC1396 observation in Figure 5. It is a 10×9 map that provides 4-wavelength coverage over about 20′×20′. Figures 6 and 7 below show the filled-out AOT front-end in SPOT, and a SPOT visualization of this observation.

7. IRS Spectral Map

This is a long-wavelength spectral map covering about 7′×7′ with two of the IRS slits, LL and LH. Note that the orientations of the two different slits are NOT the same! Figures 8 and 9 show the filled-out AOT front-end in SPOT, and a SPOT visualization of this observation.

8. Spitzer Documentation

– **New to the infrared?** A guide for professional astronomers new to the infrared, the *Infrared Compendium*, is available online at the SSC website.

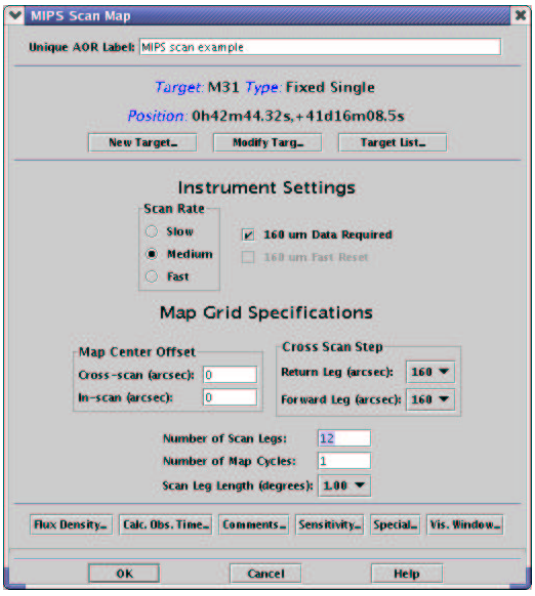

Figure 3. MIPS Photometry AOT

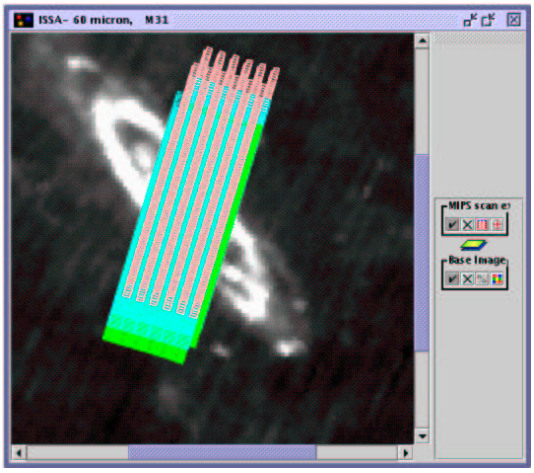

Figure 4. MIPS Photometry Visualization (blue=24, green=70, pink=160)

archive interface tool, was also released then. New versions are expected in Fall 2004

– A new Spitzer Observer's Manual (SOM; v. 4.5) came out 28 June 04; a new version is expected in Fall 2004.
– A new version of the Observation Planning Cookbook (step-by-step observation planning) came out 26 Jan 04; a new version is expected in Fall 2004..
– MIPS and IRAC Data Handbooks were released in May 04; slightly new versions of both have since been posted, along with example code.
– Post-BCD (post-processing) software and documentation is available on the SSC website as well.
– Existing Spitzer observations DO NOT RESERVE TAR-

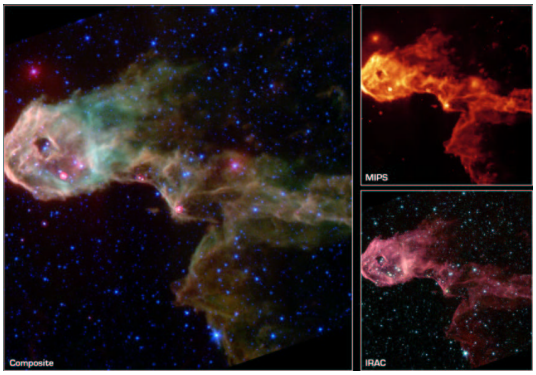

Figure 5. IRAC and MIPS Observations of IC1396, a dark globule in an HII region (NASA/JPL-Caltech/W. Reach (SSC))

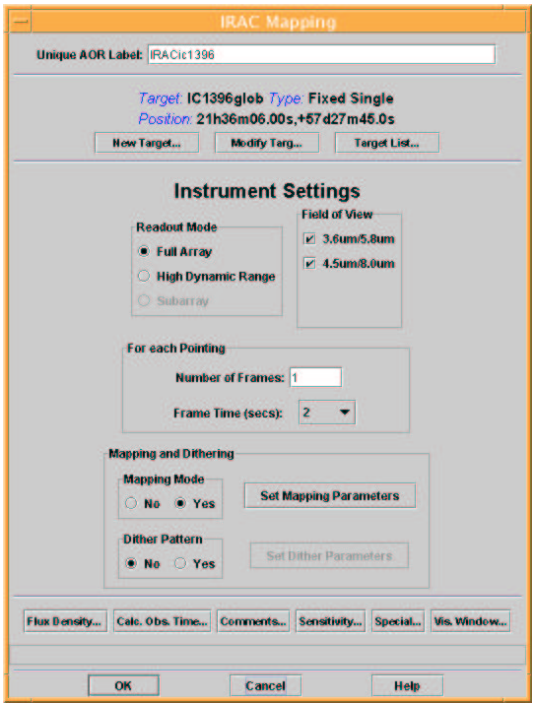

Figure 6. IRAC AOT

ically justified (e.g. time variable phenomena). The list of existing observations is the Reserved Observations Catalog (ROC); a new version which incorporates all of the newly accepted GO observations is due out this summer.

9. Where to get manuals, software, etc.

The Spitzer Science Center Website has all the answers! http://ssc.spitzer.caltech.edu/

Questions? help@spitzer.caltech.edu

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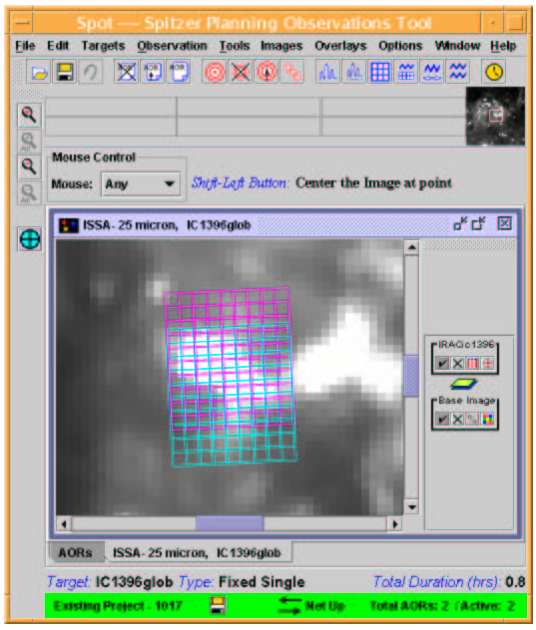

Figure 7. IRAC Map Visualization (magenta=4.5 and 8, cyan=3.6 and 5.8)

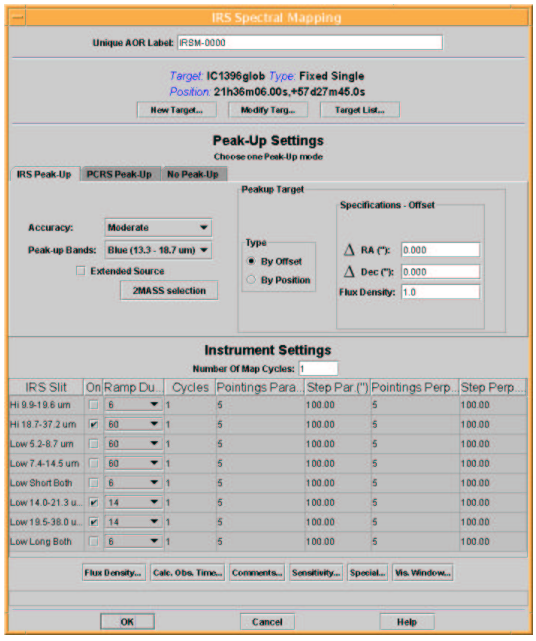

Figure 8. IRS AOT

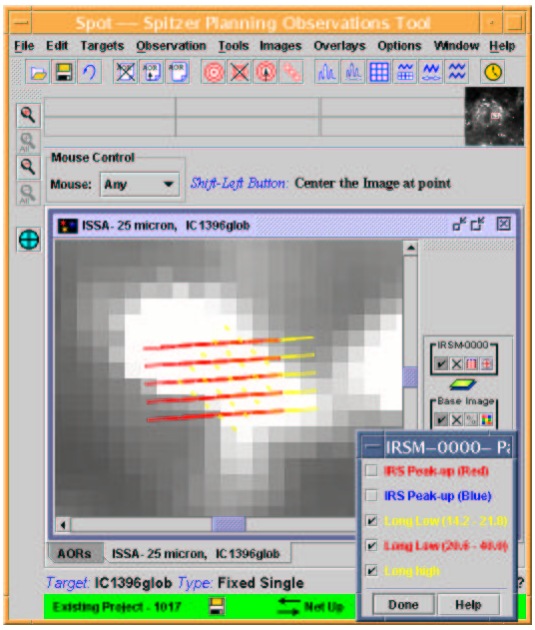

Figure 9. IRS Spectral Map Visualization (LL is long slit, red and yellow; LH is short slit in yellow.)