Spitzer Space Telescope Observing Rules

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Description

2007 August 15 8.0 Lisa Storrie-Lombardi
Major updates for Cycle-5, the last cryogenic observing cycle.

2006 November 1 7.0 Lisa Storrie-Lombardi
Modified the definition of a duplication (Rule 2.1). The integration time per pixel was reduced to a factor of four from a factor of nine. Other minor modifications were made to clarify rules.

2005 November 1 6.0 Lisa Storrie-Lombardi
Removed references to GTO modification periods in Procedures (Rule 2.2) since GTOs now submit and modify programs on the regular GO Cycle. Updated Rule 2.2 with current software information. Modified definitions of Approved Programs (Rule 3.2) to take into account new GTO and Legacy programs. Modified rules for Major Modifications (Rule 4.1) to reflect that GTO, Legacy, and GO observations are treated similarly starting with Cycle-3. Modified Rule 8 that allowed GTOs to use uncommissioned AOTs at their own risk. Modified Rule 13 to remove the requirement that the SSC publicize any failed observations in the Call for Proposals. The status of failed AORs is available via Leopard, the SSC Archive software. Other minor modifications were made to clarify rules.

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Add integration time explicitly to duplication definition in Rule 2.1. Change slew overhead from 180 to 215 seconds. Other minor modifications.

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Add reference to two new AOTs in Rule 8. Modification of duplications text in Rule 2. Minor modifications to text throughout.

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Change Document title from "Observing Policies." Omission of text pertaining to declaration of Legacy Science AORs (**Error! Reference source not found.**). Minor modifications in text throughout.

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Online references added to Rule 1. Modification to Rule 2.1. Modification to Rule 5 (intro). Online references added to Rule 5.1. Rule 6 reformatted to include Rule 6.1. New Rule 6.2 added.

2000 April 28 1.1 Bicay, M. D.
Minor modifications to Rule 1. Targets of Opportunity added as Rule 5. Subsequent Rules renumbered as 6 – 14.

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Initial Version

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Table of Contents

These observing rules pertain to all categories of science observations made with the Spitzer Space Telescope, unless explicitly stated otherwise.

1 Definition of Science Observing Time

All of the wall-clock time required for the execution of a specific observation, by means of an Astronomical Observation Request (AOR), will be charged to that particular AOR. This assessment of observing time starts with the beginning of the sequence of events associated with the AOR and continues until the completion of the events in that AOR. Assessed time shall include all science integration time, readout time, internal calibrations, and routine instrument/spacecraft motions embedded within the AOR.

In addition, there will be overheads assessed to every AOR in order to distribute necessary Observatory activities among all science observations. For the Cycle-5 Call for Proposals (CP), each AOR will be assessed 215 seconds to account for telescope slew time, regardless of the actual time utilized. Moving target AORs are assessed an additional 300 second overhead to account for the additional commands required to schedule moving targets. The algorithm used to calculate observing time, including standard overheads, is integrated into the software time estimators that scientists use in planning observations. Overhead burdens are reevaluated from one observing cycle to another.

Target of Opportunity (ToO) observations and Solar System observations that require late ephemeris updates (*i.e.,* within five weeks of the observations) will be assessed additional overhead burdens based on the degree of disruption to the onboard observing schedule (§5.1). These overheads will reflect the lost observing time that was allocated to other programs if the observations are executed, and will be factored into the proposal review conducted by the Time Allocation Committee. Proposals *must* include these overheads in the total requested observation time.

Any proposals seeking multiple-instrument observations on timescales shorter than the normal instrument campaign (7-21 days) will be assessed special overheads in observing time by the SSC. Proposals *must* include these overheads in the total requested observation time.

The total observing time assessed to a program shall consist of the sum of observing times for each of its constituent AORs, including applicable overhead burdens.

Note that Observatory engineering, calibration and telemetry activities are functions of the SSC, and the wall-clock time required to perform these functions is accounted for separately from the science observing time. Any estimates of General Observer time published as part of a *Call for Proposals* will refer to the science observing time, and will be derived after adequate time for facility activities is reserved.

2 Duplicate Observations

In order to ensure the most efficient use of the Spitzer Space Telescope, proposed observations that duplicate those already executed or approved for execution (and therefore in the Science Operations Database) will not be permitted without the explicit approval of the SSC Director, or

designee. Archival data should be used whenever possible to accomplish the science goals of any proposed investigation.

2.1 Definitions

Given the large number of Spitzer observations annually (> 20,000), it is important to define quantitative thresholds which permit automated checking of AORs to identify candidates for duplication. These flagged AORs will be checked manually by SSC staff to ascertain the degree of duplication between the candidate observations. Two or more observations are considered to be potential duplicates when one of the conditions described in criterion #1 is met and both criterion #2 and criterion #3 apply:

1. One of conditions a-d exist:
    a. Both of the observations are executed with the same Astronomical Observation Template (AOT).
    b. One of the observations is executed with the IRS Staring-Mode Spectroscopy mode and the other is executed with the IRS Spectral Mapping mode and the observations are conducted with the same IRS module.
    c. One of the observations is executed with the MIPS Photometry/Super-Resolution Imaging mode and the other is executed with the MIPS Scan Mapping mode.
    d. One of the observations is executed with the MIPS Photometry/Super-Resolution Imaging (24 micron array selected) or Scan Mapping Mode and the other is executed with the IRS Peak-up Imaging mode (red array selected).

2. The integration time per pixel for each observation agrees to within a factor of four (corresponding to a factor of ~two in sensitivity).

3. The areas on the sky covered by two proposed imaging observations overlap by more than 25% of either of the fields/areas being compared. For spectroscopic observations with IRS, the area overlap shall mean that the targets are considered to be potential duplicates if the target positions are closer together than one-half of the slit length/width of the appropriate IRS module for extended/point sources, respectively. Note that for very large programs, an area overlap of less than 25% could still translate into a significant amount of Spitzer observing time. Observations with area overlaps less than 25%, but greater than 10 hours of observing time, will receive additional scrutiny by the SSC and may be disallowed by the SSC Director.

Note that a lengthy observation within the same observing proposal may be segmented because of operational constraints, and that the series of component observations will not be deemed to be duplicates.

Newly proposed observations that are identified to be potential duplicates must be approved by the SSC Director. Approval will be contingent on a legitimate scientific justification for carrying out the new observations. Examples of observations that may be approved include: synoptic observations of time-variable phenomena and second-epoch (or later) observations searching for transient phenomena. Another example includes a large-area survey, where excising ("cutting out") a small area to avoid overlap with a previously cataloged observation is so inefficient that it

increases the observing time for the affected observation. Finally, a proposed observation resulting from an evolution of the Spitzer AOTs and which leads to a demonstrably better observation strategy for a particular science goal will be considered for approval.

If a new candidate observation is less sensitive than a previously accepted observation and if it meets the area overlap criterion above, it will always be considered a duplicate since the science objective of the new program can be achieved using the deeper observation.

In general, the data from an approved duplicate observation will be embargoed by the SSC (i.e., not released to the second investigator) until the proprietary rights (§14) of the original observer end.

2.2 Procedures

It is the responsibility of any investigator to avoid proposing duplicate observations, apart from the exclusions listed in this sub-section. Each Call for Proposals is accompanied by a comprehensive list of targets and AORs previously approved (§3.2). All previously approved and executed observations can also be queried using *Leopard*, the SSC Archive software. Any newly proposed AOR meeting the criteria listed in §2.1 will be deemed a potential duplicate observation. If the new observation is obviously a different target, it will be permitted. If manual inspection reveals the new observation to be a duplicate, the proposed observation will (in general) be forbidden.

Though the SSC will endeavor to identify all duplicate observations, it is the responsibility of Principal Investigators of existing approved programs to check the Reserved Observations Catalog released after each completed proposal cycle to determine if any newly approved observations are duplications of any part of their program(s). The SSC should be alerted if any duplications are found.

One exception to the duplicate observation policy described in §2.1 is the case where a series of observations of the same target are intended to search for time-variable phenomena. In this case, a single observation of the same area of the sky will not disallow the time-series observations. On the other hand, if the time-series observations occur *before* the single observation, it will disallow the single observation (since the objectives of the single observation could be achieved by using data from the time-series observations).

Previously accepted observations (i.e., AORs already entered into the Science Operations Database, or SODB) will always take priority over newly proposed observations. A new or modified AOR that is found to be a duplicate of an existing AOR cannot be entered into the SODB without special permission granted by the SSC Director. To be granted this dispensation, the investigator who stands to lose a proposed duplicate observation must file a request to the Director, describing why the AOR already entered in the SODB cannot be utilized in the proposed investigation. Basing a request solely on the time lag associated with gaining access to data from an existing AOR (whose observation may not yet have been executed and whose data may not enter the public domain until proprietary rights expire) will be insufficient, unless such a delay will significantly compromise the timing and integrity of the proposed investigation.

[Affected investigators can always contact the Principal Investigator of the original AOR to seek access to the required data.]

Investigators must describe their observations unambiguously by completing AORs. When proposals are submitted, observations that are potentially duplicates of observations already listed in the SODB will be noted by the SSC, and this information will be provided to the Time Allocation Committee (TAC). In general, the TAC shall not recommend observations that duplicate approved observations from a previous Cycle. The final program for a Cycle recommended by the TAC and approved by the SSC Director may include programs with intra-Cycle duplications. These observations will in general be executed by the SSC as approved.

The SSC Director shall have final authority to either allow or disallow duplicate observations.

3 Declaration of AORs

As a general rule, the earliest description of an approved observation -- via completion of a valid Astronomical Observation Request (AOR) -- shall reserve priority rights in the case of duplication(s).

3.1 Definition of Approved Programs

For every category of Spitzer Space Telescope observing time, an approved program is established in a different manner.

For Guaranteed Time Observations (GTOs), the approved programs for the first 2.5 years of the cryogenic mission consist of the complete list of AORs and corresponding program abstracts submitted in response to a Request for GTO Program Submission issued by the SSC. The Project Scientist has the responsibility to verify that the submitted programs are conflict-free. Starting with Cycle-3, the additional approved GTO programs are defined in the same way as the GO programs described below.

For the original Legacy Science projects, the approved programs consist of the full list of AORs and corresponding abstracts submitted in 2001. Starting with Cycle-2, the additional approved Legacy programs are defined in the same way as the GO programs described below.

For General Observer (GO) investigations, the approved programs will consist of abstracts and either of the following: (i) all of the original AORs submitted as part of a GO proposal that has been accepted without any modifications recommended by the TAC, or (ii) a revised list of AORs that has been modified in response to specific TAC recommendations.

For Director's Discretionary Time (DDT) observations, the approved programs consist of the AORs based on approved DDT proposals and the corresponding abstracts.

3.2 Reserved Observations Catalog

Each Call for Proposals (CP) is accompanied by a *Reserved Observations Catalog (ROC)*, a tabular list of targets and observing modes excerpted from the Science Operations Database. The ROC includes all AORs previously approved through all Spitzer observing programs. It also includes AORs resulting from time awarded through the Spitzer Fellowship Program, science

quality In-Orbit Checkout/Science Verification observations and the instrument calibrations AORs.

During the time when a CP is active (i.e., between the release of the CP and the selection of observations for the pertinent observing cycle), no major changes are permitted in the ROC. *An exception to the ROC freeze during active CPs may be granted to successful Spitzer Fellowship applicants that are awarded observing time as part of their fellowship.*

4 Modification of AORs

To accommodate the inevitable need of investigators to modify and refine their approved observations, procedures are established to allow for this process. The intent of these procedures is to allow adequate flexibility in modifying a Spitzer observing program to maximize the scientific value of an approved observation. The guiding principles underlying these procedures are:

- All programs executed by the Spitzer Space Telescope are properly reviewed and approved. The approval process described below is intended to ensure that the modified program, as executed, is approved and avoids duplicate observations.

- All modifications shall be such that the program stays within its originally allocated observing time.

The procedures described here exclude the procedures that will be followed in the catastrophic loss of a major instrumental or telescope function.

4.1 Types of Modifications

The Principal Investigator, according to the precepts and schedule outlined below, can modify an Astronomical Observation Request (AOR) in the Science Operations Database (SODB) electronically. Once an AOR has been scheduled for observation, typically five to eight weeks before execution, it cannot be modified without approval (which will be rare) of the SSC Director.

All requests for modification of approved AORs must be approved by the SSC Science User Support Team, which will characterize the request as one of two types. Minor modifications consist of small changes of target parameters, typically a few arcseconds in celestial coordinates, or small changes in AOR execution time (< 20%), subject to the total observing time in an investigation remaining constant. Minor modifications could also include small changes of other parameters in the AOR (e.g., change to high-dynamic mode in the IRAC AOR), as long as the changes do not alter the scientific content or intent of the original AOR.

Major modifications to an individual AOR consist of those changes that would substantially alter the scientific content or intent of the AOR. Examples of major modifications include:

- Changing the observing mode for an observation (e.g., from MIPS scan map to IRAC imaging).

- Changing the execution time of an AOR by 20 percent or more, thereby increasing the probability that duplicate observations might arise.
- Changing the sensitivity by a factor of 1.5 or more.
- Changing the target coordinates, or boundary area, by an astronomically significant amount.
- Changing the target to a different target judged by the investigator to be scientifically equivalent to the original target.

The execution of an approved observation may become infeasible (§12) or prove to be scientifically useless because of unanticipated circumstances. If these events occur, and if an observer can a priori demonstrate that the approved AOR will yield useless data, the Principal Investigator can submit a request to make major modifications to the AOR. The proposed modifications must be consistent with the original scientific intent of the approved observation and the observing time granted. In addition, it cannot duplicate any other approved observation, and must be approved by the SSC Director.

Requests for major modifications to any approved observing program or AOR must be made to the SSC Science User Support Team through the Helpdesk (help@spitzer.caltech.edu), and must be accompanied by adequate justification. Modifications are contingent upon approval by the SSC Director, or designee. Once the request for a modification is approved, the requestor may modify the AOR/program, with assistance provided by SSC Science User Support Team. The latter is responsible for insuring that the modifications are implemented as approved.

4.2 Blackout Period

There is a blackout period during which no *major* modifications to approved AORs or programs can be performed. The contents of the *Reserved Observations Catalog (ROC)* are frozen, and major modifications are not permitted while a solicitation for proposals for a new observing Cycle is active. This time period runs from the date the Call for Proposals is issued until the proposal submission date passes.

An exception to the ROC freeze during active CPs may be granted to successful Spitzer Fellow applicants that are awarded observing time as part of their fellowship. These observations may take precedence over duplicate observations proposed for Cycle 5. A maximum of fifty hours of observing time can be awarded annually with the Spitzer Space Telescope Fellowships.

5 Targets of Opportunity

Targets of Opportunity (ToO) are transient phenomena whose timing and/or location on the sky are unpredictable. They include objects that can be generically identified before the onset of such phenomena (e.g., recurrent novae, variable stars) and predictable phenomena that can be expected, although whose precise timing cannot be specified *a priori* (e.g., newly discovered comets, novae, supernovae, gamma-ray bursts).

Predictable phenomena whose exact timing may remain uncertain at the time of proposal submission should be submitted in response to a General Observer Call for Proposals (CP). Observations of completely unanticipated phenomena can be requested through Director's Discretionary Time (DDT) procedures.

By its very nature, a ToO warrants urgent consideration and attention, and unique procedures to handle such observations are therefore accommodated within all categories of Spitzer observing programs. At the time of proposal submission, investigators will classify each ToO request, based on the degree to which the execution of such an observation affects normal scheduling and observing procedures.

A General Observer proposal must include a valid Astronomical Observation Request (AOR) for each predictable ToO observation. The AOR must be completed in as much detail as possible, lacking perhaps the precise target position (i.e., a "null target") and refined integration times. The proposal must present a detailed plan of observations that will be implemented if the specific event occurs. Moreover, it must also provide an estimate of the probability of occurrence of the specified event during the relevant Spitzer observing cycle(s).

The SSC Director reserves the right to designate any ToO data for early release when such a release is deemed (by the Director) to be in the interest of the community.

5.1 Classification of Impact

At the time of proposal/AOR submission, investigators must classify each ToO observation into one of three categories based upon the impact that the observation will have on the normal scheduling and observing procedures (if approved). The classification scheme is based solely on the time elapsed between the activation of a Target of Opportunity AOR (§5.2) and the execution of the corresponding observation:

High-Impact	**< 1 week (normally a minimum 48-hour turnaround)**
Medium-Impact	**1-5 weeks**
Low-Impact	**> 5 weeks**

Even if the date of the required observation can be determined well in advance, if ANY update to the observing sequence is required less than 5 weeks before execution then the observation must be submitted as a medium or high impact ToO.

Apart from the overhead burdens applied to all Spitzer observations (§1), the SSC will impose no additional overheads on low-impact ToO observations. The SSC has developed separate calculations of Observatory overheads to be assessed against the high- and medium-impact categories of ToO observations. These special overhead burdens are described online within the 'Proposal Kit' section of the SSC website. Proposals must include these overheads in the total requested observation time.

An investigator will self-determine the appropriate category, based upon the maximum delay (in their judgment) that is scientifically acceptable between the activation of an approved AOR and the execution of the observation. This information will be useful in permitting the SSC and the Time Allocation Committee (TAC) to scientifically assess the value of the ToO observation vis-à-vis other approved observations.

The Principal Investigator of a 'high-impact' ToO observation must include, as part of the observing proposal, strong justifications for a rapid turnaround of ToO data by the SSC and (if relevant) compelling evidence to support the need for rapid instrument changes. In general, the more disruptive the ToO observation is to normal scheduling and operations, the stronger the justification must be to have the proposed observation approved.

Any ToO proposals seeking multiple-instrument observations on timescales shorter than the normal instrument campaign (7-21 days) will be assessed special overheads in observing time by the SSC. These overheads will reflect the observing time estimated to be lost to other programs if the approved ToO observations are activated, and will be factored into the proposal review conducted by the TAC. Proposals *must* include these overheads in the total requested observation time.

5.2 Activation of AORs

For an approved ToO, the Principal Investigator (PI) via the Spitzer Helpdesk (help@spitzer.caltech.edu) must electronically submit a request for AOR activation to the SSC Director. Following the request for activation, the SSC will ascertain the feasibility of conducting the ToO observations, taking into account sky visibility and the schedule of instrument campaigns. The observer will also submit a revised AOR, with precise coordinates and integration time. If the observations cannot be conducted on a schedule requested by the investigator, the SSC Director will consult with the Principal Investigator on the scientific utility of later observations. The SSC Director must issue final approval for any high-impact ToO observations requiring an interruption of the onboard observing schedule.

An approved ToO observation will be executed only in the event that the specified phenomenon actually occurs within the relevant observing cycle. If the triggering event for an approved ToO observation does not occur during the observing cycle, the AOR will be deactivated at the end of the cycle. In the event that a ToO observation expires without execution, the allotted observing time will be returned to the General Observer pool.

5.3 Regulation of Observations

The SSC Director will rely on the recommendations of the Time Allocation Committee to assess the benefits of a proposed ToO observation against any disruptions to the efficient planning and scheduling of science observations with the Spitzer Space Telescope. Because of the heavy impact that high- and medium-impact ToO observations will have on the schedule, no more than ten of these rapid-execution ToO observations will be approved and executed in any given observing cycle. *For Cycle-5 the SSC anticipates approving no more than five high/medium impact ToOs.*

6 Generic Targets

Generic targets denote observations that fail to qualify as Targets of Opportunity (i.e., they have more refined and predictive spatial and temporal information than ToOs), and can be scientifically described, but lack precise celestial coordinates or brightness estimates *at the time of Spitzer proposal submission*. A generic target can be selected from a complementary observing program with Spitzer, or with any other telescope, but one where the conditional observations (assumed to be under the control of or clearly available to the Spitzer Principal

Investigator) are scheduled or will be scheduled with high likelihood, but not yet executed or analyzed prior to the Spitzer proposal deadline.

An investigator may propose observations of generic targets, describing them in as much detail as possible in a Spitzer observing proposal. The investigator must submit AORs with celestial positions accurate to within 2 degrees (radius), and with integration times specified to within a factor of 1.5. After the complementary observations are obtained and analyzed, the Principal Investigator must modify the generic target AOR and include the precise celestial coordinates and integration time before the observations can be scheduled. **In Cycle-5 the AORs for all generic targets must be completely specified and ready to schedule by June 1, 2008.** The observations must be completed within the observing time allocation awarded when the proposal was approved.

An example of a generic target involves Spitzer follow-up observations of targets culled from a ground-based supernova search program. In this case, the investigator would demonstrate that scheduled ground-based observing time is likely to yield enough supernovae to create a credible Spitzer proposal. However, the initial observations have not yet been made at the time of Spitzer proposal submission. Once the ground-based data have been taken, the proposing investigator must specify the celestial coordinates of the new supernovae, an integration time, and submit a completed AOR at least eight weeks prior to observing. [If a more rapid response is required, the observations must be treated as a Target of Opportunity; see §5.]

Any generic target observation that will require an update to the observing sequence less than 5 weeks prior to execution must be submitted as a medium or high impact ToO.

6.1 Necessary Conditions

Proposals seeking to observe generic targets will be accepted for consideration through the normal processes if the following (relevant) conditions are satisfied:

- Rules pertaining to duplicate observations and priority of target selection (as specified in §2) apply. The basic principle is that the first observer who specifies the AOR with sufficient completeness to permit execution of the AOR has priority for the observation.

- The generic target observations are specified in celestial coordinates to < 2 deg (radius) in the initial AOR/proposal (see §6.2 for an exception pertaining to moving targets). The reason for submitting approximate coordinates is to enable the SSC to properly assess the over-subscription of various areas of the celestial sphere in making the observing time allocations.

- The generic targets are selected from datasets to which the proposing investigator has clear access.

- Observations of generic targets that require timely execution of Spitzer Space Telescope observations and rapid turnaround of validated data to the investigator (in order to specify second-look observations) are accepted at the risk to the observer. In other words, the

SSC cannot guarantee that the sequence of Spitzer observations and follow-up observations will be executed completely.

6.2 Moving Targets

Generic moving targets meet all of the criteria above, except that the target positions for observations cannot be specified within 2 degrees because these objects move significantly in position on the sky between their discovery and subsequent Spitzer observation. Proposers must submit an AOR for a generic moving target with a target position 'to be determined' (from Navigation and Ancillary Information Facility identification, or from orbital elements).

Generic moving targets, like the analogous celestially fixed targets, must be selected from observations under the control of the investigator. The proposer must estimate the number of such targets to be observed with Spitzer, based on well-defined criteria. Examples of generic moving targets include near-Earth asteroids, main-belt asteroids, Centaurs and Kuiper Belt Objects. Because of the time urgency of observations, comets near perihelion should be treated as Targets of Opportunity (§5).

7 Second-Look Observations

Second-look observations are not allowed as part of Cycle-5 proposals.

A scientifically important factor in planning and implementing any category of observational investigation with the Spitzer Space Telescope is the ability to discover new phenomena or peculiar objects and then to characterize a sub-sample of them in a timely manner -- for the benefit of the entire user community. *Second-look observations (SLOs)* are deemed to be a predictable element of an integrated Spitzer observing program, even if they cannot be completely described at the time of proposal submission. Requests for SLOs must be included in the original proposal and must be described in as much detail as possible. The SLO concept applies to GTO, GO and Legacy investigations.

For example, an investigator can propose to conduct IRAC or MIPS imaging observations to identify objects with extreme color ratios, and then conduct IRS spectroscopy to characterize these objects. The spectroscopic observations comprise the second-look observations, and comprise a legitimate portion of the proposed scientific investigation. No more than ten percent of the total observing time being requested in a proposal may be allocated towards SLOs. Moreover, SLOs can include generic targets (see §6). In all cases, the SLOs must be justified as an integral part of the proposed science program at the time of proposal submission. The targets and AORs for approved second-look observations must be completely specified within two months of the time that the data from Spitzer necessary for their specification is made available in the archive.

Proprietary data periods for SLOs that are part of an approved program are the same as for any other element of that program.

8 Commissioning of AOTs

An Astronomical Observation Template (AOT) must be tested, validated and commissioned by the SSC before routine science observations can be executed with the corresponding observing mode. The commissioning of an AOT entails a wide variety of activities, and includes the verification of spacecraft command sequences, proper operability of the science instrument, and the proper input of spacecraft data and output of calibrated data by the relevant automated processing pipeline at the SSC.

All eight commissioned Spitzer Space Telescope AOTs are currently available to Observers:

- IRAC Mapping/Photometry
- IRS Staring-Mode Spectroscopy
- MIPS Photometry/Super-Resolution Imaging
- MIPS Scan Mapping
- IRS Spectral Mapping
- MIPS Spectral Energy Distribution
- MIPS Total Power
- IRS Peak-up Imaging

9 Routine Calibrations

The SSC establishes and maintains the calibration of each Spitzer science instrument to levels specified in the individual instrument chapters contained within the *Spitzer Observer's Manual*. The routine calibrations to be executed by the SSC on behalf of the community are described on the SSC website at the time of each *Call for Proposals*. Data resulting from routine facility calibrations generally enters the public domain immediately upon processing and validation by the SSC.

The initial on-orbit calibration of the Observatory, including the three science instruments, was performed during the In-Orbit Checkout period and Science Verification phase as part of the commissioning of each observing mode (or Astronomical Observation Template, AOT). Observations of celestial targets necessary to establish the calibration of each AOT is part of the commissioning process for the AOT, and will not be subject to rules regarding duplicate observations (§2).

If the SSC must use an observation that duplicates a previously approved science program AOR for routine calibration purposes, the resultant calibration data will be embargoed from scientific utilization until the proprietary period of the original observer ends.

The initial on-orbit calibration of the telescope was performed as part of the commissioning of each observing mode. After an AOT is commissioned for general use, the SSC conducts the periodic observations necessary to maintain such calibrations. Calibration observations make up 5-15% of the observing time per instrument campaign. Celestial and internal calibrations are a component of each 7-21 day instrument campaign. Observations of celestial targets necessary to maintain the calibration of each AOT are not subject to rules regarding duplicate observations.

Expected and achieved calibration accuracy for AORs processed with the normal calibration pipelines is published as part of the *Spitzer Observer's Manual*. For observations that require a higher level of calibration, and therefore special calibration observations (see §10), it is the responsibility of the requesting investigator to include those special calibration observations as part of their proposed observational program.

10 Special Calibrations

Any additional calibration(s) that are not included as part of routine calibrations (§9) conducted by the SSC will be regarded as special calibrations, and are the responsibility of the approved investigator. The observing time required to conduct such special calibrations will be charged against the observer's allocation and must be included in the original science proposal. The SSC will process such observations through the normal data processing pipeline(s). The investigator is responsible for using these data for the special calibration requirements of their program. The normal proprietary data period applies to special calibration data that are part of an approved science program.

All Spitzer Space Telescope data, including routine and special calibrations, can be accessed and analyzed by appropriate SSC instrument specialists to assess instrument performance and to develop improved or necessary instrument calibrations. For such use of special calibration data, strict confidentiality will be maintained throughout the normal proprietary period.

11 Use of Parallel Observations

Only one Spitzer Space Telescope science instrument can be operated at any given time.

All of the science data obtained via a single Astronomical Observation Request (AOR) will be considered to belong to the requestor of the observation, and will be subject to the same proprietary data rights as the explicitly requested data. That is, the proprietary rules and periods apply to all of the data collected via a specific AOR, whether or not the observer explicitly requested it as part of their proposed science program. The four-channel IRAC camera aboard Spitzer provides an example of such parallel observations. When imaging the sky at 3.6 and/or 5.8 microns, an offset field of view simultaneously collects images at 4.5 and 8.0 microns. All of the IRAC data are collected and processed via a single AOR, and hence are under the control of the Principal Investigator.

12 Infeasible or Non-Schedulable Observations

All approved observations are accepted with the understanding that there can be no guarantee that the observations will actually be obtained. In previous cycles, the SSC has made all reasonable efforts to execute all approved observations. In Cycle-5 more observations than can possibly be scheduled are being selected (see §3.5.2 of the Cycle-5 Call for Proposals).

In specifying observations through the completion of Astronomical Observation Requests (AORs), the front-end graphical user interface to the Astronomical Observation Template (AOT) will not process invalid parameters. Therefore, a completed AOR represents a 'doable' observation, in principle. In practice, however, it could turn out that the actual execution of some observations could prove to be highly difficult or impossible. For example, on-orbit events

may conspire to restrict the range of acceptable or safe AOT parameters, and thereby make previously approved observations infeasible. If the AOR can be modified to make the observation feasible, the Principal Investigator will be given the opportunity to make these modifications. Otherwise, the AOR will be abandoned without execution. Guaranteed Time Observers will be permitted to re-allocate the relevant time from abandoned observations to another observation in their existing programs. The SSC Director will determine the usage of abandoned time from the General Observer and Legacy investigations.

13 Failed Observations

A failed observation is one that cannot be calibrated, or where a significant fraction of the data is lost or severely corrupted, or where the data processing system (the "pipeline") is incapable of processing the observation. Some failures may result from instrument anomalies, while other failures may be due to the loss of data in transmission.

If an investigator believes that an observation has failed or has been seriously corrupted or degraded he/she can submit a written request to the SSC Science User Support Team via the Helpdesk (help@spitzer.caltech.edu) for a repeated observation. Any request for a repeated observation must be filed within **two months** of the investigator's data being made available to the investigator. If the SSC concurs with the request, attempts will be made to repeat the observation. The SSC Director reserves the right, in cases where the request for a repeated observation is approved, to place the failed/degraded observations into the public archive immediately. The request for a repeated observation will not be granted when the PI has committed an error in specifying the AOR.

If an investigator has obtained more than 90% of the data in a planned and approved observing program, and the missing data are not uniquely important for scientific goals of the program, then the request for a repeated observation will not normally be granted.

Given the uncertain duration of Cycle-5 it is unlikely that any failed observations will be rescheduled.

14 Data Rights

Most observers have exclusive access to their science data during a proprietary period, intended to facilitate the processing and scientific analysis of the data by the relevant investigator. For General Observer and Guaranteed Time Observers, Spitzer Space Telescope observations shall have a proprietary data period of twelve months, commencing from the time that scientifically usable data from fully commissioned pipelines are made available to the Principal Investigator via the Spitzer Science Archive. Once the proprietary period expires, the raw and pipeline-processed data will enter the public domain and be available to anyone through the Spitzer Science Archive. **The SSC does not anticipate having resources to do duplication checks or embargoing data from duplicating observations in the Warm Mission. Therefore the SSC may not be able to ensure a one-year proprietary period for Cycle-5 observations.**

The SSC Director reserves the right to designate any Target of Opportunity data for early release when such a release is deemed to be in the interest of the community.

There are no proprietary data rights for observations obtained through the original Legacy Science Program or the Legacy General Observer program. These data enter the public domain immediately after pipeline processing and quality analyses are performed by the SSC.

Because observations obtained through Director's Discretionary Time (DDT) are assumed to be urgent and of interest to the broad scientific community, proprietary periods for DDT observations will not exceed three months. The SSC Director reserves the right to make all raw and calibrated data publicly available immediately as a condition for approving a DDT request, particularly where the data involves an unexpected Target of Opportunity.

The Spitzer Time Allocation Committee may recommend a shorter proprietary period for individual proposals, particularly from the Large and Medium categories, due to the high value of the data to the general astronomical community. As part of their proposal, observers may request that the SSC Director waive all or part of their proprietary period if the proposal is approved.

15 Publication and Dissemination of Science Results

It is expected that scientific results obtained through Spitzer Space Telescope observations, archival research, and theoretical investigations will be published in the scientific literature. All publications based on Spitzer data must carry an appropriate acknowledgement. Investigators should consult the SSC website for the appropriate acknowledgement template(s) (http://ssc.spitzer.caltech.edu/approvdprog/ackn.html).

In papers describing Spitzer results, investigators should provide reference(s) to seminal papers describing the Observatory, including the relevant science instruments. These references are posted on the SSC website at [http://ssc.spitzer.caltech.edu/pubs/seminalobs.html]. Moreover, the SSC encourages investigators to provide reference(s) to seminal Legacy Science project results, where appropriate (http://ssc.spitzer.caltech.edu/legacy/all.html).

The publication and dissemination of Spitzer science results is critical in assessing the success of the mission, and its contributions to NASA's strategic plans in space science. The Spitzer community is reminded of the important responsibility inherent in utilizing this national resource, and in sharing the scientific results with the general public. The SSC Director encourages investigators with newsworthy results to utilize the resources and services of the SSC, JPL and NASA to help disseminate important results to the mass media and to the general public.

Appendix: Acronyms and Abbreviations

AOR	Astronomical Observation Request(s)
AOT	Astronomical Observation Template(s)
CP	Call for Proposals
DDT	Director's Discretionary Time
GO	General Observer(s)
GTO	Guaranteed Time Observer(s)
IRAC	InfraRed Array Camera
IRS	InfraRed Spectrograph
JPL	Jet Propulsion Laboratory
MIPS	Multiband Imaging Photometer for Spitzer
NASA	National Aeronautics and Space Administration
PI	Principal Investigator
ROC	Reserved Observations Catalog
SLO	Second-Look Observation(s)
SODB	Science Operations Database
SSC	Spitzer Science Center
TAC	Time Allocation Committee
ToO	Target(s) of Opportunity