Spitzer Space Telescope

Cycle-5 Call for Proposals

Version 1.0 15 August 2007

General Observer Program
Legacy General Observer Program
Archival Research Program
Theoretical Research Program
Guaranteed Time Observer Program

Key Dates:

Call for Proposals Issued:	August 15, 2007
Proposals Due:	November 16, 2007 5:00 pm (PST), Friday
Cycle-5 Observations Start:	July 2008

http://ssc.spitzer.caltech.edu/

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Table of Contents

1 OVERVIEW 1

1.1 EXECUTIVE SUMMARY 1
1.2 PROPOSAL PLANNING 3
1.3 PROPOSAL REVIEW 3
1.4 PROPOSAL SUBMISSION 3

2 INTRODUCTION TO CYCLE-5 5

3 MISSION OVERVIEW 7

3.1 TELESCOPE 7
3.2 ORBIT/SKY VISIBILITY 7
3.3 SCIENCE PAYLOAD 8
3.4 OBSERVING MODES/AOTS 9
3.4.1 Special Observing Modes - IERs 9
3.5 OBSERVATION SCHEDULING 10
3.5.1 MIPS 160 micron Observations 10
3.5.2 Cycle-5 Scheduling 10
3.5.3 Managing Execution of GO, Legacy and GTO Programs 11
3.5.4 Unexecuted AORs 11
3.6 SCIENCE OPERATIONS 11

4 ELIGIBILITY 12

4.1 WHO MAY SUBMIT A PROPOSAL 12
4.2 FUNDING SUPPORT 12
4.2.1 Phasing of Cycle-5 Funding 13
4.2.2 Overview of Research Funding Instruments 13
4.2.2.1 RSA -- Research Support Agreement 13
4.2.2.2 CREI -- Cost Reimbursement with an Educational Institution 14
4.2.2.3 Other JPL Contracts 14
4.2.2.4 Direct NASA Funding 14

5 PROPOSAL CATEGORIES 15

5.1 GENERAL OBSERVER AND LEGACY GENERAL OBSERVER PROGRAMS 15
5.1.1 Observing Time Available 15
5.1.2 Types of GO Investigations 15
5.1.2.1 Legacy General Observer Proposals 16
5.1.2.2 High-Risk/High-Gain Science 16
5.1.3 Parallel Observations 16
5.1.4 Multi-Cycle Observations 16
5.1.5 Targets of Opportunity 17
5.1.6 Second-Look Observations 17
5.1.7 Generic Targets 18
5.1.8 *Statistical Programs 18*
5.1.9 Joint Observing Proposals 18
5.1.9.1 Joint Spitzer/NOAO Observations 19
5.1.9.2 Joint Spitzer/NRAO Observations 20
5.1.10 Director's Discretionary Time 21
5.1.11 Data Analysis Support 21
5.1.12 Data Rights 22
5.2 ARCHIVAL AND THEORETICAL RESEARCH PROGRAMS 23
5.2.1 Archival Research Program 24
5.2.2 Theoretical Research Program 24
5.3 GUARANTEED TIME OBSERVER PROGRAMS 24

6 26

6 PROPOSAL PLANNING 26

6.1 TECHNICAL DOCUMENTATION 26
6.2 THE PROPOSAL KIT 27
6.3 GTO OBSERVATIONS 28
6.4 LEGACY SCIENCE PROGRAM 28
6.5 ADDITIONAL GUIDELINES FOR OBSERVERS 29
6.5.1 Duplicate Observations 29
6.5.2 Constrained Observations 30
6.5.3 Calibration Observations 30
6.5.4 Bright Object Observations 31
6.6 MOVING TARGET EPHEMERIDES 31
6.7 BASELINE INSTRUMENT CAMPAIGN 32
6.8 SSC ASSISTANCE 32

7 PROPOSAL SUBMISSION 33

7.1 PROPOSAL SUBMISSION DEADLINE 34
7.2 PROPOSAL FORMATS 35
7.2.1 Cover Sheet 35
7.2.1.1 Science Category 35
7.2.2 Astronomical Observation Requests (AORs) 35
7.2.3 PDF Attachment – Page Limits 35
7.3 OBSERVING PROPOSAL CONTENTS 37
7.3.1 Science Justification 37
7.3.2 Technical Plan 37
7.3.2.1 Joint Spitzer-NOAO Observations 38
7.3.2.2 Joint Spitzer-NRAO Observations 39
7.3.3 Data Products Plan – Legacy General Observer Proposals 39
7.3.4 Other Contents 40
7.3.4.1 Figures and Tables 40
7.3.4.2 Observation Summary Table 40
7.3.4.3 References 40
7.3.4.4 Brief Resume and Bibliography 41
7.3.4.5 Existing Observatory Programs 41
7.3.4.6 Data Analysis Funding Distribution & Financial Contact Information 41
7.3.4.7 Modification of Proprietary Period 41
7.3.4.8 Justification of Duplicate Observations 41
7.3.4.9 Justification of Scheduling Constraints 41
7.3.5 Astronomical Observation Requests (AORs) 42
7.4 ARCHIVAL & THEORETICAL RESEARCH PROPOSAL CONTENTS 42
7.4.1 Science Justification 43
7.4.1.1 Archival Research 43
7.4.1.2 Theoretical Research 43
7.4.2 Technical Plan 44
7.4.2.1 Archival Research 44
7.4.2.2 Theoretical Research 44
7.4.2.3 Statement of Work and Schedule 44
7.4.3 Figures and Tables 44
7.4.4 References 44
7.4.5 Brief Resume and Bibliography 44
7.4.6 Existing Observatory Programs 45
7.4.7 Financial Contact Information & Cost Plan 45
7.5 SUBMISSION OF PROPOSALS 46
7.5.1 Submitting your Proposal for the First Time 46
7.5.2 Updating Your Submitted Proposal 47
7.5.3 Modifications to Proposals After the Deadline 47
7.6 PROPOSAL CONFIDENTIALITY 47

8 PROPOSAL EVALUATION AND SELECTION 49
8.1 PEER REVIEW 49
8.2 EVALUATION CRITERIA 50
8.3 PROPOSAL SELECTION 51
9 CONTACTING THE SPITZER SCIENCE CENTER (SSC) 52
10 PUBLICATION AND DISSEMINATION OF SCIENCE RESULTS 53
10.1 SCIENCE PUBLICATIONS 53
10.2 PRESS RELEASES 53
11 EDUCATION AND PUBLIC OUTREACH PROGRAMS 54
12 GUIDE FOR OBSERVING PROPOSALS 55
13 GUIDE FOR ARCHIVAL/THEORETICAL RESEARCHERS 56
14 APPENDIX A: SPITZER SPACE TELESCOPE OBSERVING RULES 57
14.1 DEFINITION OF SCIENCE OBSERVING TIME 57
14.2 DUPLICATE OBSERVATIONS 58
14.2.1 Definitions 58
14.2.2 Procedures 59
14.3 DECLARATION OF AORS 60
14.3.1 Definition of Approved Programs 60
14.3.2 Reserved Observations Catalog 61
14.4 MODIFICATION OF AORS 61
14.4.1 Types of Modifications 61
14.4.2 Blackout Period 62
14.5 TARGETS OF OPPORTUNITY 62
14.5.1 Classification of Impact 63
14.5.2 Activation of AORs 64
14.5.3 Regulation of Observations 64
14.6 GENERIC TARGETS 65
14.6.1 Necessary Conditions 65
14.6.2 Moving Targets 66
14.7 SECOND-LOOK OBSERVATIONS 66
14.8 COMMISSIONING OF AOTS 67
14.9 ROUTINE CALIBRATIONS 67
14.10 SPECIAL CALIBRATIONS 68
14.11 USE OF PARALLEL OBSERVATIONS 68
14.12 INFEASIBLE OR NON-SCHEDULABLE OBSERVATIONS 68
14.13 FAILED OBSERVATIONS 69
14.14 DATA RIGHTS 69
14.15 PUBLICATION AND DISSEMINATION OF SCIENCE RESULTS 70
15 APPENDIX B: SPITZER SPACE TELESCOPE SCIENCE SCHEDULE 71
15.1 SPITZER WARM MISSION 71
16 APPENDIX C: LEGACY SCIENCE PROGRAM 72
17 APPENDIX D: DIRECTOR'S DISCRETIONARY TIME 73
18 APPENDIX E: SPECIAL TELESCOPE OVERHEADS 74
19 APPENDIX F: ALLOWABLE COSTS 76
19.1 SALARIES AND WAGES 76
19.2 RESEARCH ASSISTANCE 76
19.3 FRINGE BENEFITS 76
19.4 PUBLICATION COSTS 76

19.5 TRAVEL 77
19.6 COMPUTER SERVICES 77
19.7 EQUIPMENT 77
19.8 MATERIALS AND SUPPLIES 77
19.9 INDIRECT COSTS (IDCS) 77
20 APPENDIX G: ACRONYMS AND ABBREVIATIONS 78

The Spitzer Science Center (SSC) is operated by the California Institute of Technology for the Jet Propulsion Laboratory (JPL) and the National Aeronautics and Space Administration (NASA).

1 Overview

Cycle-5 is Spitzer's final cryogenic observing cycle and the duration is uncertain. The best estimate for the cryogen depletion date is March 31, 2009. Proposals are due November 16, 2007 and Cycle-5 begins July 1, 2008. The SSC anticipates having 2-3 months of Cycle-4 observations left to execute when Cycle-5 begins. *Nominally we will be able to execute 6 months of selected Cycle-5 observations before the cryogen is depleted.* A full year's worth of observations (5600 GO/Legacy + 1050 GTO) will be selected but the likelihood of being scheduled will be based on the scientific ranking from the review process.

Proposals are encouraged that:

1. fill scientific gaps in the Spitzer program
2. pursue follow-on observations of uniquely Spitzer discoveries
3. exploit the unique capabilities of Spitzer during the final cryogenic observing cycle.

The archival value of proposed observations has been added as an explicit selection criterion. To assist proposers in understanding the breadth of the Spitzer science mission we have consolidated information about prior successful programs on the SSC website at http://ssc.spitzer.caltech.edu/approvdprog/.

1.1 Executive Summary

This Call for Proposals (CP) invites investigators worldwide to submit Spitzer Space Telescope Cycle-5 General Observer (GO), Legacy General Observer (Legacy), Archival Research (AR) and Theoretical Research (TR) proposals.

There are substantial changes in many sections of the CP compared to previous cycles. We strongly recommend that proposers read the CP and in particular the following sections:

Section	Features
1	General Overview of what is new in Cycle-5
3.5.2	Cycle-5 scheduling and scheduling priorities
3.5.3	Managing execution of GO/Legacy/GTO observations
4.2.1	Phasing of Cycle-5 data analysis funding
5.1.2	Proposal categories and sizes – large program discouraged
5.1.2.1	Modifications to the Legacy program
5.1.2.2	High-risk/high-gain science
5.1.6	No second-look observations allowed
5.1.8	Statistical proposals are allowed
5.1.9	Modifications to joint observing programs
5.2	Major modifications to Archive/Theory proposals
7.3.5	Changes to AOR overheads for moving targets

General Observer proposals seek observing time in one three categories: small (up to 50 hours), medium (50-200 hours) and large (> 200 hours). **Large (> 200 hour) proposals will be accepted but are discouraged due to the uncertainties in the duration of Cycle-5.** Large programs may be difficult to schedule and complete and/or take up an inordinate proportion of the cycle. Our best estimate is that 6 months of selected Cycle-5 observations will be executed. Following recommendations from our Science Users Panel and our Oversight Committee, large proposals are not precluded, but will require a very high science ranking from the review for selection.

Legacy General Observer proposals seek observing time of > 50 hours, request no proprietary data rights for their program and promise to return enhanced science data products to the astronomical community. The hallmark of these Legacy projects is the applicability of the data to research beyond the objectives of the proposed investigation. Spitzer GO/Legacy programs that require time on NOAO facilities (including Gemini, excluding Keck and Magellan) or the NRAO facilities may also be proposed. No joint Hubble Space Telescope or Chandra X-ray Observatory observations are offered in Cycle-5. Data analysis support per hour awarded will be similar to what was provided in Cycle-4.

The Director will make available up to 200 hours of Director's Discretionary Time that the Time Allocation Committee can allocate to high-risk/high-gain programs that have a very high science ranking. Every Cycle there are programs identified by the TAC that are very exciting but do not end up being selected since there are ample proposals available with a better guaranteed science return even if they are somewhat less compelling. These 200 hours of DDT time may only be allocated for programs deemed high-risk/high-gain. The TAC may not allocate it as part of the general pool for Cycle-5. These programs will be identified by the TAC from the pool of submitted Cycle-5 GO proposals.

Archival (AR) and Theoretical (TR) Research proposals should be submitted only if investigators are seeking NASA data analysis support. It is anticipated that ~$2 million in Cycle-5 data analysis support will be made available for Archival and Theoretical investigations. Detailed budgets are not required in Cycle-5 for AR/TR proposals. Proposers must request even $25,000 increments from $25,000-$150,000. This modification to the AR/TR proposal process will allow the majority of the AR/TR contracts to be issued with Research Support Agreements (see §4.2.2.1). If no funds are required to support the archive or theory investigation, no Cycle-5 proposal should be submitted.

Guaranteed Time Observer (GTO) proposals will also be submitted for 1050 hours of observing time allocated in Cycle-5. The SSC will manage the scheduling in Cycle-5 such that the percentage of the GTO and GO programs executed are comparable, e.g. when 25% of the GO/Legacy program has been executed we expect that ~25% of the GTO program will also have been executed.

All proposals must be submitted electronically to the Spitzer Science Center (SSC). The proposal deadline is Friday, November 16, 2007, 5:00 pm (Pacific Standard Time).

1.2 Proposal Planning

This call for proposals (CP) provides an overview of the technical capabilities of the observatory (§3), eligibility criteria (§4), the current research opportunities (§5) and information on planning (§6) and submitting (§7) a proposal. The CP is accompanied by other technical documents (see §6.1). Interested scientists may retrieve digital copies of these documents from the Proposal Kit section of the Spitzer Science Center (SSC) website (http://ssc.spitzer.caltech.edu/propkit). An important component of the Proposal Kit is *Spot*, the Spitzer software required for observation planning and proposal submission. **All Cycle-5 proposals must be submitted with *Spot***, a free software package available within the online Proposal Kit. *Spot* must be downloaded to your computer.

In addition to handling proposal submission, *Spot* allows General Observers (GOs) to construct detailed Astronomical Observation Requests (AORs) by specifying observation parameters for the required observing modes. *Spot* also includes useful visualization tools to permit the GO investigator to see how proposed Spitzer observations will be laid out on the sky.

Questions about proposal planning should be sent to the Spitzer Helpdesk (help@spitzer.caltech.edu).

1.3 Proposal Review

Topical Science Review Panels and a Time Allocation Committee (TAC) organized by the Spitzer Science Center (SSC) will review and evaluate the proposals according to the criteria listed in §8.2. The TAC will recommend a list of programs to the SSC Director, who is the ultimate selection official for all Cycle-5 research programs.

Upon selection by the SSC Director, observing programs are entered into the Spitzer observations database for execution as part of Cycle-5, commencing in July 2008.

1.4 Proposal Submission

A GO proposal requests Spitzer Space Telescope observing time and consists of these elements:

- A scientific justification for the program.
- A technical plan describing how the scientific investigation will be implemented, including an explanation of target selection and observing modes, and how the data will be analyzed.
- Detailed specification of Spitzer observations, through Astronomical Observation Requests (AORs) generated by *Spot*.

A Legacy proposal includes the elements listed above for GO programs and adds the following:

- A statement that no proprietary period is requested for the data, i.e. the nominal one-year proprietary period is waived.
- A plan for returning enhanced science data products to the community.
- A program design that ensures the observational data will have wide utility to the broader scientific community.

No cost plans are required for GO or Legacy proposals. The science data analysis funding for approved and eligible investigators will be determined through formulaic means (§5.1.11). Successful Legacy proposers will also be allocated additional funds, via contracts, specifically for creating and delivering the enhanced data products.

In general, observations that are deemed to duplicate those previously executed or approved for execution on the observatory are strongly discouraged. Such observations may be proposed but must be specifically justified. The SSC Director may approve such observations based on the recommendation of the TAC and subsequent review. Proposers should consult the *Spitzer Space Telescope Observing Rules* to determine what constitutes a duplicate observation. The *Observing Rules* are also reproduced in their entirety in Appendix A of the current document. Proposers should use *Leopard*, the SSC archive interface tool, to search all observations that have been executed or approved for execution for potential duplications. The *Reserved Observations Catalog* is also available online in list form.

AR and TR proposals are only submitted if the proposer seeks funding support. AR and TR proposals must request one of six amounts, in even $25,000 increments from $25,000 to $150,000.

An AR proposal consists of these elements:

- A scientific justification for the proposed archival research.
- A technical implementation and data analysis plan, including a statement of work and description of how the funds will be utilized. *A detailed budget is no longer required with the proposal.*

A TR proposal is submitted only if the proposer seeks funding support. A TR proposal consists of these elements:

- A scientific justification for the proposed theoretical research.
- A technical plan that describes how the results (models, algorithms, etc.) will be made available to the community, including a statement of work and description of how the funds will be utilized. *A detailed budget is no longer required with the proposal.*

All proposals should be submitted to the SSC electronically, using the proposal submission tool integrated into *Spot* (Version S16). Proposals must conform to all requirements and constraints described in this CP, in particular the format and page limits listed in §7.2. The proposal submission deadline for all proposals is 5:00 pm (Pacific Standard Time) on Friday, November 16, 2007.

2 Introduction to Cycle-5

This *Call for Proposals (CP)* solicits participation to conduct Cycle-5 Spitzer Space Telescope research. Investigations may be proposed in one of five categories:

General Observer (GO) Program

This program allows investigators to propose new observations with the Spitzer Space Telescope. Proposals are categorized as *small* (less than 50 hours), *medium* (50 to 200 hours) or *large* (> 200 hours). Large programs are discouraged in Cycle-5. GO proposals *cannot* contain an archival component specifically requesting funding. A separate archival proposal should be submitted if archival data funding is desired.

Legacy General Observer (Legacy) Program

This program allows investigators to propose new observations with the Spitzer Space Telescope. Legacy programs must be greater than 50 hours, have no proprietary period, and must create and return to the astronomical community enhanced data products (e.g. reduced images, spectra, catalogs and appropriate documentation). The program must be designed so that the observational data will have wide utility to the broader scientific community.

Guaranteed Time Observer (GTO) Program

1050 hours are available to the Guaranteed Time Observers who built the Spitzer focal plane instruments.

Archival Research (AR) Program

The AR Program provides funding support for the analysis of Spitzer data publicly available in the archive by December 31, 2008. Proposers should anticipate that all of the Spitzer data from the Original and Cycle-2 and Cycle-3 Legacy Programs will be available, including enhanced data products returned to the SSC by these Legacy teams for distribution to the community. The data from the Cycle-4 Legacy teams should also be available, although their enhanced data products are unlikely to be available for Cycle-5. Laboratory astrophysics relevant to Spitzer observations is an acceptable component of an archival proposal. AR proposals *cannot* contain a GO component. A separate GO proposal must be submitted if new Spitzer observations are desired.

Theoretical Research (TR) Program

The TR Program provides funding support for theoretical research of direct relevance to Spitzer science. The program should provide lasting benefit for current or future observational programs with Spitzer. TR proposals *cannot* contain a GO component. A separate GO proposal must be submitted if new Spitzer observations are desired.

Spitzer uses a mainly single-phase proposal submission process. Proposers must utilize *Spot*, the SSC proposal planning and submission software, to specify their observations and calculate the observing time necessary to successfully complete the proposed program. For small (< 50 hours) proposals and *all* GTO proposals, a complete set of proposed observations (Astronomical Observation Requests), generated by *Spot* must be submitted as part of the proposal. All other Spitzer GO/Legacy proposals requesting > 50 hours must include representative AORs that cover all requested observing modes as well as a complete target list and description of the proposed observations. The complete set of AORs will be submitted after the proposal has been approved. Supporting technical and programmatic documentation for this CP is listed in §6.1. These

documents are all available online in the Proposal Kit section of the SSC website (http://ssc.spitzer.caltech.edu/propkit).

Questions pertaining to the Cycle-5 CP should be sent electronically to the Spitzer Helpdesk at *help@spitzer.caltech.edu.* Questions (and answers) that are deemed by the SSC to be of broad interest to Spitzer investigators are listed in the Frequently Asked Questions section of the SSC website.

3 Mission Overview

This section briefly summarizes the scientific capabilities of the Spitzer Space Telescope. The reader is urged to consult the companion document, the *Spitzer Space Telescope Observer's Manual (SOM)*, for complete technical details of the telescope, including the three science instruments. The SOM is available in the Proposal Kit section of the Spitzer Science Center (SSC) website (http://ssc.spitzer.caltech.edu/propkit).

The Spitzer Space Telescope is the fourth and final element in NASA's family of Great Observatories and represents an important scientific and technical component of NASA's Astronomical Search for Origins Program. Spitzer consists of a cryogenically cooled 0.85-meter diameter telescope and three science instruments capable of performing imaging and spectroscopy in the 3 to 180 micron range. The telescope was launched from Cape Canaveral, Florida into an Earth-trailing heliocentric orbit on August 25, 2003. The cryogen is expected to last until March 2009.

3.1 Telescope

The Spitzer telescope is of Cassegrain design, with beryllium optics, and can be cooled to < 5.5 K. The telescope offers pointing accuracy of better than 1.0 arcsec (1-sigma radial rms), and pointing stability of 0.1 arcsec (1-sigma radial rms, 200 sec) with the star-tracker. An angular resolution of ~1.5 arcsec is achieved at the diffraction limit of 5.5 microns. The typical field-of-view is ~5 arcmin square for imaging. Spitzer is capable of achieving tracking rates of ~1 arcsec/sec for fast-moving (e.g., Solar System) targets.

3.2 Orbit/Sky Visibility

The Spitzer Space Telescope is in an Earth-trailing heliocentric orbit with radius 1 AU, and is drifting away from Earth at a rate of about 0.1 AU per year. In this orbit, the telescope is in a benign thermal environment. Moreover, this choice of orbit substantially reduces the projection of the Sun-Earth-Moon avoidance zones on the sky, yielding high astronomical observing efficiencies.

The telescope's instantaneous visibility region is a 37.5-degree wide annulus, extending from 82.5° to 120° in solar elongation, and encompassing all ecliptic latitudes. The size of this region is constrained in two ways. First, the telescope cannot point within 82.5 degrees of the Sun, for reasons of thermal control. Second, the telescope cannot point more than 120 degrees from the Sun, in order to maintain sufficient illumination of the power-generating solar panels. About one-third of the entire sky is accessible to Spitzer at any given time.

The amount of time that any particular target is visible to Spitzer is a function of ecliptic latitude. Objects with |ecliptic-latitude| > 82.5° are located within the Continuous Viewing Zone, and those with 60° < |ecliptic-latitude| < 82.5° are annually visible to Spitzer in one continuous ~7-month time interval. Targets with |ecliptic-latitude| < 60° are observable twice per year in ~40-day windows. For any given target position, sky visibility is available using *Spot*, the Spitzer observation planning software (§6.2).

3.3 Science Payload

The Spitzer Space Telescope science payload consists of three instruments, cryogenically cooled with liquid helium to ~1.5 K. ***Only one of the instruments can be operated at a time,*** and instrument campaigns of 7-21 days duration are the norm.

The **InfraRed Array Camera (IRAC)** provides simultaneous ~5 arcmin square images in four channels ($\lambda / \Delta\lambda \sim 4$) centered at 3.6 microns (Channel 1), 4.5 microns (Channel 2), 5.8 microns (Channel 3) and 8.0 microns (Channel 4). The 256 x 256 focal-plane arrays use Indium Antimonide (InSb) detectors for the two short-wavelength channels, and Arsenic-doped Silicon (Si:As) impurity-band conductors (IBC) for the two longer wavelengths. The pixel size for each detector array is ~1.2 arcsec. Two nearby fields of view (FOV) are simultaneously imaged in pairs using dichroic beam splitters, with Channels 1 and 3 comprising one FOV, and Channels 2 and 4 the other. The Principal Investigator for IRAC is Giovanni G. Fazio, Smithsonian Astrophysical Observatory, Harvard-Smithsonian Center for Astrophysics.

The **InfraRed Spectrograph (IRS)** provides spectroscopic capabilities with low- and high-spectral resolutions from wavelengths of 5.2 to 38.0 microns. The IRS is composed of four separate modules, incorporating two types of 128 x 128 IBC arrays: Arsenic-doped Silicon (Si:As) at the shorter wavelengths, and Antimony-doped Silicon (Si:Sb) at the longer wavelengths. Two of the modules provide low spectral resolution ($\lambda / \Delta\lambda = 64\text{-}128$): the short-wavelength module covering 5.2 to 14.5 microns, with a pixel scale of ~1.8 arcsec and FOV of 3.6 x 57 arcsec, and the long-wavelength module providing coverage from 14.0 to 38.0 microns, with a pixel scale of 5.1 arcsec and a 10.5 x 168 arcsec FOV. The low-resolution modules employ long-slit designs that allow both spectral and one-dimensional spatial data to be acquired simultaneously on the same detector array. The other two modules provide high spectral resolution ($\lambda / \Delta\lambda = 600$): the short-wavelength module covering 9.9 to 19.6 microns, with a pixel scale of 2.3 arcsec and FOV of 4.7 x 11.3 arcsec, and the long-wavelength module providing coverage from 18.7 to 37.2 microns, with a pixel scale of 4.5 arcsec and an 11.1 x 22.3 arcsec FOV. The high-resolution modules use a cross-dispersed echelle design to provide both spectral and limited spatial measurements on the same detector array. Each module has its own entrance slit in the focal plane. The IRS has no moving parts.

An internal "peak-up" array can be used to locate and position sources on the spectrograph slits to better than the blind pointing accuracy of the telescope. The peak-up array has 1.8 arcsec square pixels, and offers two filters covering 13.5-18.5 microns and 18.5-26 microns. In target acquisition mode the FOV of the peak-up arrays is software limited to 43 x 43 arcsec. The peak-up arrays can also be used for direct imaging with a 1 x 1.2 arcmin FOV. The Principal Investigator for IRS is James R. Houck, Cornell University.

The **Multiband Imaging Photometer for Spitzer (MIPS**) provides imaging and photometric capabilities in three broad bands centered at 24, 70 and 160 microns. In addition, MIPS is capable of measuring low-resolution ($\lambda / \Delta\lambda = 15\text{-}25$) spectral energy distributions (SED) between 55 and 95 microns. The instrument uses three types of detector arrays: an Arsenic-doped Silicon (Si:As) 128 x 128 IBC array at 24 microns, an unstressed Gallium-doped Germanium (Ge:Ga) 32 x 32 array at 70 microns for imaging/photometry and for measurements of spectral energy distributions (SED), and a stressed Ge:Ga 2 x 20 array at 160 microns. The

functionally useful area of the 70-micron array is 32 x 16 pixels. MIPS samples the telescope's Airy disk with pixels smaller than the Nyquist limit. The FOVs are approximately 5-arcmin square at 24 microns, 2.5 x 5 arcmin at 70 microns, and 0.5 x 5 arcmin at 160 microns. The 70-micron array features a high-magnification (super-resolution) mode, with a 2x improvement in effective resolution. MIPS utilizes an internal scan mirror to facilitate efficient mapping of large areas. The scan mirror also enables absolute sky brightness measurements. The MIPS Principal Investigator is George Rieke, Steward Observatory, University of Arizona.

Additional technical details about each of the science instruments are provided in Chapters 6 through 8 of the *Spitzer Observer's Manual (SOM).*

3.4 Observing Modes/AOTs

In Cycle-5, Spitzer Space Telescope observations will be executed with one of eight distinct observing modes. Observers completely specify their observations through the use of Astronomical Observation Templates (AOTs), one for each observing mode. The complete specification of targets and observing parameters is done using *Spot*, the software for Spitzer observation planning. The AOTs in *Spot* provide observers with control of all the relevant parameters for their observation. An AOT with target information and observer-selected parameters specified becomes an Astronomical Observation Request (AOR), the fundamental unit of Spitzer observing.

The Spitzer observing modes/AOTs are listed below. Details about these observing modes and the available choice of AOT parameters are provided in the *Spitzer Observer's Manual*. The eight observing modes available for Cycle-5 Observers are:

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

Complete sets of AORs covering the entire observing program must be submitted with proposals requesting less than 50 hours of observing time and all GTO proposals. A representative set of AORs that fully describes the observing program must be submitted with GO/Legacy proposals requesting 50 hours or more of observing time (though the entire set may also be submitted).

The maximum duration for IRS and IRAC AORs is eight hours. The MIPS maximum duration remains three hours.

3.4.1 Special Observing Modes - IERs

In special circumstances, observations that cannot be supported with one of the eight AOTs may be executed with Instrument Engineering Requests (IERs). Due to the SSC resources required to support the creation and execution of IERs, these observations will only be approved in a very limited number of cases for very highly ranked science programs.

3.5 Observation Scheduling

3.5.1 MIPS 160 micron Observations

In order to maximize Spitzer's cryogenic lifetime, MIPS campaigns are organized into "warm" (telescope cooled to 8.5K) or "cold" (5.7K) campaigns. *Programs requiring MIPS 160 micron observations must justify this specifically in the proposal.* If MIPS Scan AORs are requested and the 160 micron observations are required to accomplish the science objectives of the program, the '160 micron required' checkbox must be selected in the AORs. AORs requiring 160 micron will be segregated and scheduled only in cold (5.7K) MIPS campaigns. MIPS observations not requiring 160-micron data will be scheduled in warm (8.5K) or cold (5.7K) campaigns. Programs requiring 160-micron data will be more difficult to schedule given that every MIPS campaign will not be 'cold'. Proposers should carefully consider the science objectives of their program before requesting 160-micron data.

A proposal can contain both 'warm' and 'cold' MIPS AORs. The AORs are scheduled individually, not as a program.

3.5.2 Cycle-5 Scheduling

Cycle-5 is the last cryogenic cycle and we expect it to last 8-10 months. We will select an entire year of observations at the Cycle-5 review and expect to execute half of these prior to the cryogen depletion. Observations will again be assigned scheduling priorities. 25% of the selected Cycle-5 observations will be assigned priority 1, 25% will be assigned priority 2 and 50% will be assigned priority 3.

We will make every effort to schedule all priority 1 observations. Priority 2 observations will also be placed immediately into the scheduling pool. *Observations with priority 3 will not enter the scheduling pool until 6 months into the cycle or until the number of AORs in the scheduling pool becomes too low to allow even moderately efficient scheduling.* We will accept a slight decrease in scheduling efficiency (<5%) to ensure that the highest priority science is executed first. Completion of programs that are started will be our goal. We will fund eligible priority 1 observations at the beginning of Cycle-5. Observations with priorities 2 and 3 will be funded after the program begins execution on the observatory.

All observations selected in Cycle-4 will be not executed by the end of that Cycle. The observations remaining in the pool at the end of Cycle-4 will mostly be those with priority 3. When the Cycle-5 program is selected, observations from Cycle-4 will not immediately be given top priority for scheduling but they will be moved up one priority level. For example, Cycle-4 observations with priority 3 will be given priority 2 in Cycle-5. We expect to have 2-3 months of Cycle-4 observations left to schedule at the start of Cycle-5.

Estimates for the total hours of observations that will be completed in Cycle-5 range from 3500-7000 for worst and best cases in the cryogen lifetime.

Worst case depletion date 12/31/08 -- 1500 hours of Cycle-4 + 2000 hours of Cycle-5

Nominal depletion date 3/31/09 -- 1500 hours of Cycle-4 + 3750 hours of Cycle-5

Best case depletion date 6/30/09 -- 1500 hours of Cycle-4 + 5500 hours of Cycle-5

3.5.3 Managing Execution of GO, Legacy and GTO Programs

More observations are being selected in Cycle-5 than will be executed. In previous cycles the GTO programs have typically begun scheduling earlier in the cycle since they are put into the scheduling pool with cursory technical reviews. Due to the uncertainty in the duration of Cycle-5 we will be managing the percentage of the GTO and GO/Legacy programs that have been completed. The SSC will endeavor to execute the same percentage of the different types of programs on a quarterly basis.

3.5.4 Unexecuted AORs

Any AORs that have not been executed when the cryogen is depleted will be deleted from the science operations database. AORs selected during the cryogenic cycles will not be executed during Spitzer warm operations. The SSC does not have the resources to support the modification and review necessary to translate IRAC cryo-AORs into IRAC warm-AORs or support reworking of science programs to utilize a warm IRAC.

3.6 Science Operations

An integrated team of personnel from the Jet Propulsion Laboratory (JPL), Lockheed Martin (Denver) and the Spitzer Science Center (SSC) conducts flight operations for Spitzer. Science operations activities are based at the SSC, on the campus of the California Institute of Technology, Pasadena. The SSC solicits observational, archival and theoretical research investigations through Calls for Proposals; organizes the peer review of the proposals by science experts; and administers supporting NASA research funds for investigations selected by the SSC Director. In addition, the SSC schedules all science observations (including calibrations), conducts pipeline processing of all Spitzer Space Telescope data and places the data in the electronically accessible science data archive.

4 Eligibility

Investigators worldwide are eligible to submit a proposal in response to the Spitzer Space Telescope Cycle-5 *Call for Proposals*. The Spitzer Science Center (SSC) will offer NASA funding to investigators affiliated with U.S.-based institutions, subject to availability and the limitations cited below, to support the analysis of data from proposals selected by the SSC.

4.1 Who May Submit a Proposal

This solicitation for General Observer (GO), Legacy General Observer (Legacy), Archival Research (AR) and Theoretical Research (TR) is open to investigators of any nationality. Each proposal must identify a single individual who will serve as Principal Investigator (PI) and will be responsible for the scientific and administrative conduct of the project. *The PI for GO/Legacy proposals may have any institutional affiliation. The PI for AR/TR proposals must have a U.S. institutional affiliation.* There is no limit to the number of Co-Investigators (Co-Is) that may appear on a proposal. The PI may designate a Technical Contact for purposes of communications with the SSC Science User Support Team.

GO and Legacy Program proposals requesting Spitzer observing time may be submitted by non-U.S. based PIs. *If such a proposal includes U.S.-based Co-Is who intend to request data analysis support from NASA, see the special instructions in §5.1.11.*

Any investigator may conduct archival research with Spitzer data in the public domain. AR and TR proposals should be submitted only if the U.S.-based Principal Investigator is seeking NASA funding support.

Guaranteed Time Observer (GTO) proposals may be submitted by the three Spitzer instrument team PIs: James R. Houck, Giovanni G. Fazio, and George H. Rieke or by individuals they have specifically authorized as PIs for part of their GTO time. GTO proposals submitted with a PI other than Houck, Fazio and Rieke must include the instrument team PI authorizing the time as a CoI on the proposal.

Graduate students and post-docs can apply for Spitzer time as principal investigators. *Before applying they should check with their advisors regarding any specific requirements of their home institution regarding proposal submission*. The proposal can have an administrative PI (for funding purposes). Administrative PI information will be collected for any such proposals *after* the proposal is approved.

4.2 Funding Support

The SSC will provide financial support for Cycle-5 investigators, subject to the availability of NASA funds and the eligibility guidelines described below. Investigators affiliated with U.S.-based institutions, regardless of nationality, are eligible for funding support. Investigators may be affiliated with educational institutions, non-profit non-academic organizations, industry, NASA centers and other government agencies.

The SSC cannot award NASA research funds to investigators affiliated with non-U.S. institutions. While non-U.S. based Co-Is are permitted on all proposals, no NASA funds may flow to them through the PIs. Therefore, researchers affiliated with non-U.S. institutions that propose investigations with Spitzer should seek support through their own appropriate funding agencies.

For the General Observer programs (GO and Legacy), U.S.-based Principal Investigators and Co-Investigators are eligible for funding to support data analysis. Funding awards will be determined through formulaic means. For purposes of determining funding levels, the sum of the efforts by U.S.-based Co-Investigators on a proposal led by a foreign Principal Investigator cannot exceed 50%. For additional details about the funding methodology and limitations, see §5.1.11.

Data analysis support for the GTO programs is provided separately.

For the Archival Research (AR) and Theoretical Research (TR) Programs, Principal Investigators must be affiliated with a U.S.-based institution. U.S.-based Co-Investigators on approved AR/TR proposals may be funded via a sub-award issued by the PI's home institution or directly by the SSC/JPL. AR/TR proposals will be accepted for even $25,000 increments from $25,000 to $150,000. The justification for and amount of funding to be provided to each investigator must be specified in the proposal. Detailed, institutionally endorsed budgets are not required with the proposal. Direct funding of less than $5,000 must be done with a sub-award from the PI's home institution.

The SSC will manage Spitzer research funds and will contract with the Jet Propulsion Laboratory (JPL) to administer the disbursement of most of the funds. The funding instrument used by JPL (not always a contract) will depend on whether the program is a GO/Legacy/AR/TR investigation and on the nature of the Principal Investigator's home institution. JPL is unable tos issue grants. Additional details about the Spitzer research funding contracts are provided in §4.2.2.

4.2.1 Phasing of Cycle-5 Funding

As discussed in §3.5.2 successful Cycle-5 programs assigned scheduling priority 1 will be funded as soon as funds are available in Cycle-5. Programs assigned scheduling priorities 2 and 3 will be funded after the program begins executing on the observatory.

4.2.2 Overview of Research Funding Instruments

4.2.2.1 RSA -- Research Support Agreement

The Research Support Agreement (RSA) is a simple Fixed Price, Advance Paid, subcontract provided through JPL that is used for basic research funding where scientific reports and technical data are the only deliverables and can be awarded to educational and non-profit institutions. RSAs amounts are determined formulaically or based on availability of funds for science, enhanced data product, archive and theory funding. **No budget submission to the SSC or JPL is required**, though your institution may require you to create a budget for internally handling the funds. Your institution is sent the RSA paperwork, returns the completed forms, and

JPL then mails your institution a check for the entire award amount. The administrative overhead for executing RSAs is about half that of standard contracts so using these instruments allows us to send out more money for research and pay less for the administrative costs. You have at least three years from the start of the Cycle to spend the funds, regardless of exactly when your RSA is issued. RSAs expire on the following scheduled: Cycle-1, June 2007; Cycle-2, May 2008; Cycle-3 September 2009; Cycle-4 June 2010; Cycle-5 June 2011. **No-cost extensions beyond 3-years from the start are generally not offered.**

The only reporting necessary for RSAs is a final 'end of contract' report outlining the work done and listing publications from the research. The report does not need to be exhaustive but it is necessary that we receive them. RSA awardees will be notified of how to submit their final reports. The RSAs are the fastest contracts to execute and are therefore funded first in the cycle. The SSC does not have all the funding for the Cycle available when it starts, therefore the issuance of the funding awards are spread out over about a 6-month period. The majority of RSAs are issued in the first quarter of the Cycle. Phasing of Cycle-5 funding is discussed in §4.2.1.

Institutions that are eligible to receive RSAs but elect not to accept them will generally be issued cost-reimbursable contracts**. The additional cost in issuing these contracts, rather than RSAs, may be deducted from the science funding for those investigators eligible for RSA funding but whose institutions request a different funding instrument.**

4.2.2.2 CREI -- Cost Reimbursement with an Educational Institution

CREIs are a standard JPL contract that we have used historically for Archival and Theoretical research programs for investigators at educational institutions but in Cycle-5 we will primarily issue RSAs for AR/TR contracts. However, if an institution elects not to accept an RSA, utilization of CREIs will require institutionally endorsed budgets. These will be requested after the proposal is selected. Investigators receiving CREIs are generally funded after the RSAs (§4.2.2.1) have been issued.

4.2.2.3 Other JPL Contracts

If you are at an institution that cannot accept RSAs or CREIs (e.g. a for-profit institution) then you will be funded by JPL with the appropriate contract. These programs are typically funded after the RSAs have been issued. An institutionally endorsed budget may be required and will be requested after the proposal is selected.

4.2.2.4 Direct NASA Funding

Investigators affiliated with NASA Centers will receive their award of formulaically determined funds directly from NASA, following guidance provided by the SSC. The SSC and JPL provide NASA Headquarters with the investigators, institutions and formulaically determined funding amounts, and Headquarters sends these funds directly to the appropriate NASA centers. This applies for GO, Legacy, AR and TR programs.

5 Proposal Categories

This *Call for Proposals (CP)* solicits proposals to conduct research in the General Observer (GO), Legacy General Observer (Legacy), Guaranteed Time Observer (GTO), Archival Research (AR) and Theoretical Research (TR) Programs.

5.1 General Observer and Legacy General Observer Programs

The Spitzer General Observer (GO) and Legacy General Observer (Legacy) Programs allow investigators to conduct independent research programs utilizing new Spitzer Space Telescope observations. Most of the observing time available during the science mission is devoted to peer-reviewed GO/Legacy investigations. The GO and Legacy Programs are open to all investigators worldwide on a competitive basis. AORs that are not executed by the end of Cycle-5 (end of cryogen) will be deleted from the database.

The following sub-sections contain references to the *Spitzer Space Telescope Observing Rules*, which are reproduced in their entirety as Appendix A of this CP.

5.1.1 Observing Time Available

Cycle-5 is nominally 8-10 months in duration (July 2008 through end of cryogen). We are currently scheduling 575-580 science hours per month**. We will approve a full year of observations including 5600 hours of GO/Legacy and 1050 hours of GTO time.** The nominal duration of Cycle-5 is 8-10 months and we anticipate 2-3 months of Cycle-4 AORs will remain to be scheduled at the start of Cycle-5. Please read §3.5.2 for a more detailed discussion of Cycle-5 scheduling.

5.1.2 Types of GO Investigations

Proposals will be classified into three categories, based on the amount of observing time requested:

1. Small < 50 hours
2. Medium 50-200 hours
3. Large > 200 hours THIS CATEGORY IS DISCOURAGED.

Proposals requesting 50 or more hours may be submitted as regular GO or Legacy programs. Large proposals may be difficult to schedule and complete and/or take up an inordinate proportion of the cycle. Our best estimate is that six months worth of selected Cycle-5 observations will be executed. **The SSC discourages large proposals in Cycle-5 based on recommendations from both the Science Users Panel and the Oversight Committee.** The SSC anticipates that a minimum of 20% and a maximum of 50% of the available hours will be allocated to programs requesting > 50 hours. The TAC will recommend the final distribution of time between small and medium/large programs.

5.1.2.1 Legacy General Observer Proposals

Legacy proposals have the following characteristics:

1. Spitzer observing time requested is 50 or more hours.
2. There is no proprietary period requested for the data.
3. The program is designed so that the observational data will have wide utility to the broader scientific community, well beyond the objectives of the proposed investigation.
4. The proposal has a plan for delivering enhanced data products to the astronomical community, providing lasting value for the program beyond the completion of the original science goals.

The latter three criteria differentiate Legacy proposals from regular GO proposals. Additional funding will be provided to eligible Legacy programs for the creation and delivery of the proposed enhanced data products. The funding amount is determined formulaically and awarded with a contract separate from the science funding. The SSC will provide additional details and instructions to successful Legacy proposers when the funding awards are determined.

Unlike in previous cycles, Legacy proposals (and GO proposals in general) cannot include Second-Look observations (§5.1.6) in Cycle-5. Generic targets (§5.1.7) are allowed in GO and Legacy proposals. Contrary to previous cycles, Legacy programs in Cycle-5 can include low-impact Targets of Opportunity (§5.1.5).

5.1.2.2 High-Risk/High-Gain Science

The Director will make available up to 200 hours of Director's Discretionary Time that the Time Allocation Committee can allocate to high-risk/high-gain GO programs that have a very high science ranking. These 200 hours of DDT time may only be allocated for programs deemed high risk/high gain. The TAC may not allocate it as part of the general pool for Cycle-5. The TAC will identify these programs from the pool of submitted Cycle-5 GO proposals. These proposals should be submitted as Proposal Type = GO in the coversheet, not DDT.

5.1.3 Parallel Observations

It is *not* possible to conduct parallel observations with more than one science instrument on Spitzer.

All of the science data obtained via a single Astronomical Observation Request (AOR) are deemed to be associated with that particular observation, whether or not the observer explicitly requested them as part of their proposed investigation. See Appendix A (§14.11) for examples and additional information pertaining to *single-instrument* parallel observations.

5.1.4 Multi-Cycle Observations

There are no opportunities for multi-cycle observations in Cycle-5.

5.1.5 Targets of Opportunity

Observations of phenomena whose exact timing and/or location on the sky are uncertain at the time of the proposal submission deadline (*e.g.,* a newly discovered comet or a gamma ray burst) *must* be submitted as a General Observer Target of Opportunity (ToO) proposal in response to this *Call for Proposals (CP)*. Observations of completely unanticipated phenomena can be requested through Director's Discretionary Time (DDT) procedures (see §5.1.10).

Targets of Opportunity are categorized by the extent to which the execution of such an observation affects normal scheduling and observing procedures. As part of the proposal submission, GO investigators classify each of their ToO requests, 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. A *high-impact* ToO is one with a delay of less than one week (minimum 48-hours). A *medium-impact* ToO is one with user-specified delays of one to five weeks. A *low-impact* ToO is one where the acceptable delay is longer than five weeks. Even if the specific date of an observation can be specified well in advance, if a modification to the scheduled AOR is required on a time scale of less than 5 weeks (other than moving targets requiring a late ephemeris update [Appendix E-§18]), the observations should be submitted as a medium- or high-impact ToO, as appropriate.

Additional overheads are assessed against high- and medium-impact ToO observations (see Appendix E). No additional overheads will be assessed against low-impact ToO observations. **Because of the significant effect that high/medium-impact ToO observations have on efficient telescope scheduling, the combined total of high/medium-impact ToO activations approved in Cycle-5 will not exceed five.** The additional overheads must be specified using *Spot* when the AORs for the proposal are created. From within the relevant AOR dialog click the **Special …** button and select the appropriate overheads from the list. *Spot* will calculate the required time and add it to the Total Duration returned on the main *Spot* AOR page.

In addition, 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, as listed in Appendix E. These overheads must be specified in *Spot*. They can be designated from the AOR dialog using the **Special …** button as described in the previous paragraph.

An approved ToO observation will be executed only in the event that the specified phenomenon actually occurs within Cycle-5. Additional information on Targets of Opportunity, including the procedures for activation of an approved AOR, can be found in Appendix A §(14.5).

Unexecuted Cycle-4 ToOs will not be carried forward into Cycle-5.

5.1.6 Second-Look Observations

In previous cycles, predictable and pre-planned re-visits to objects and/or fields have been an appropriate as part of observing investigations. Because of the shortened cycle **these 'second-look' observations are not allowed as part of any Cycle-5 proposal.**

5.1.7 Generic Targets

Generic targets have more refined and predictive spatial and temporal information than a ToO. Generic targets can be described scientifically, but lack *precise* celestial coordinates or brightness estimates *at the time of the proposal submission deadline*. 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 have not been 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 the proposal. An AOR accompanying a generic target must contain a celestial position accurate to within 2 degrees (radial) for fixed targets. For a moving generic target (*e.g.,* Solar System object) proposers must submit an AOR with a target position 'to be determined' from Navigation and Ancillary Information Facility (NAIF) identification, or from orbital elements. In either case, the execution time must be specified to within a factor of 1.5.

The observations must be completed within the observing time allocation awarded when the proposal was approved. Examples of generic targets and additional details and limitations pertaining to their use can be found in Appendix A (§14.6). **For Cycle-5 generic targets, AORs must be completely specified and ready to schedule by June 1, 2008.**

5.1.8 *Statistical Programs*

In Cycle-5 the SSC will accept 'statistical programs' where a specific number of observations are required for the science but the set of observations required is not unique. For example if your program requires observations of 10 targets in your sample and you have 20 targets total in the sample the proposal can be submitted with AORs specifying observations of 20 targets but time is only requested to observe 10 of them. This should be clearly described in the technical plan.

5.1.9 Joint Observing Proposals

GO and Legacy observing programs where the primary science is obtained from the Spitzer Space Telescope and where observing time utilizing NOAO facilities and/or NRAO facilities is required are supported in Cycle-5. **Due to the uncertainties in the duration of Cycle-5 and the timing between Spitzer Cycle-5, HST Cycle-17 and CXO Cycle-10 the Great Observatories are not accepting joint Spitzer proposals in these cycles.** We anticipate resuming joint Spitzer proposals with HST and CXO during the Spitzer Warm Mission (§15.1).

Spitzer Cycle-5 proposers requesting joint time with other observatories must enter the appropriate observatory acronym(s) into the Joint Proposal field in the *Spot* proposal tool, e.g. **NOAO,** and/or **NRAO.** For example, in addition to your Spitzer hours if you require 10 hours at CTIO and 10 hours at the VLA then enter **NOAO, NRAO** into the Joint Proposal field and justify the observations for NOAO and NRAO in your proposal.

5.1.9.1 Joint Spitzer/NOAO Observations

By agreement with NOAO, proposers interested in making use of observing facilities available through NOAO (including Gemini, excluding Magellan and Keck) as part of their Spitzer science may submit a single proposal in response to this CP. The award of NOAO time will be made to highly ranked Spitzer proposals and will be subject to approval by the NOAO Director. The primary criterion for the award of NOAO time is that both Spitzer and NOAO data are required to meet the scientific objectives of the proposal. The highest priority for the award of NOAO time will be given to programs that plan to publicly release the NOAO data in a timely manner (shorter than the usual 18-month NOAO proprietary period) and that create databases likely to have broad application. NOAO plans to make up to 5% of all the observing time available for this opportunity. NOAO observing time will be divided roughly equally between the spring (2009A) and fall (2009B) semesters.

Proposers wishing to make use of this opportunity must provide the following additional NOAO-related information as part of their Spitzer proposal:

1. Indicate the choice of NOAO telescope(s) and instrument(s). Dates of availability for the various telescopes and instruments can be found on the web at http://www.noao.edu/gateway/nasa/.

2. Enter the total estimated observing time for each telescope/instrument combination.

3. Specify the number of nights for each semester during which time will be required and include any observing constraints (dates, moon phase, synchronous or synoptic observations, etc.);

4. Include a full and comprehensive scientific and technical justification for the requested NOAO observing time.

5. Specify the requested proprietary period (18 months nominal) for the NOAO observations.

Demonstration of the technical feasibility of the proposed NOAO observations is the responsibility of the proposer. Detailed technical information concerning NOAO facilities may be found at http://www.noao.edu/.

If approved for NOAO time, successful PIs will be required to submit the standard NOAO forms providing detailed observing information appropriate to the telescope and instrument combination(s) awarded. *For Gemini time only* successful PIs will be required to submit a full scientific justification to NOAO. This justification will be reviewed by the regular NOAO Time Allocation Committee to determine into which Gemini queue band the observations will be placed.

NOAO will perform feasibility checks on all proposed observations and reserves the right to reject any observation determined to be unfeasible for any reason. Such a rejection could jeopardize the entire proposed science program and impact the award of the Spitzer observing

time as well. NOAO time will only be awarded in conjunction with Spitzer GO/Legacy observations and should not be proposed in conjunction with a Spitzer GTO, Archival or Theoretical Proposal.

Spitzer Cycle-5 proposers requesting NOAO time must enter '**NOAO**' into the Joint Observatories field in the *Spot* proposal tool.

5.1.9.2 Joint Spitzer/NRAO Observations

By agreement with NRAO, proposers interested in making use of the NRAO Very Large Array (VLA) and/or the Green Bank Telescope (GBT) facilities as part of their Spitzer science may submit a single proposal in response to this CP. The award of NRAO time will be made to highly ranked Spitzer proposals and will be subject to approval by the NRAO Director.

The primary criterion for the award of NRAO time is that both Spitzer and NRAO datasets are essential to meet the scientific objectives of the proposal. If the need for both facilities to satisfy the science goals is not clearly demonstrated in the proposal, the proposal will be rejected. No NRAO time will be allocated without Spitzer time. NRAO time will only be awarded in conjunction with Spitzer GO/Legacy observations and should not be proposed in conjunction with a Spitzer GTO, Archival or Theoretical proposal.

NRAO plans to make up to 200 hours of the observing time on each of the VLA and the GBT available for this opportunity with a maximum of 75 hours in any configuration/scheduling trimester and including an 18-month period close to the Spitzer Cycle such that all VLA configurations are available. The first trimester in which observations could be executed is October 2008 to January 2009.

Proposers wishing to make use of this opportunity must provide a full and comprehensive scientific and technical justification for the requested NRAO observing time. If approved for NRAO time, successful PIs will be required to submit the standard NRAO forms providing detailed observing information appropriate to the telescope and instrument combination(s) awarded. NRAO will perform final feasibility checks on the proposed observations based on the information provided on these forms and reserves the right to reject any observation determined to be infeasible for any reason. Such a rejection could jeopardize the entire proposed science program and impact the award of the Spitzer observing time as well. Proposals whose observing requests for NRAO facilities are inconsistent between the cover sheet and the scientific justification may be rejected, due to the short time period available to notice and then reconcile these inconsistencies.

Papers reporting original observations made with any NRAO instrument(s) should include the NRAO footnote in the text, as described at: http://www.nrao.edu/library/page_charges.shtml.

Spitzer Cycle-5 proposers requesting NRAO time must enter '**NRAO**' into the Joint Observatories field in the *Spot* proposal tool.

5.1.10 Director's Discretionary Time

Five percent of the total Spitzer observing time is allocated by the SSC Director as Director's Discretionary Time (DDT). This time is intended to facilitate proposals that address emerging scientific topics. Observations of completely unanticipated phenomena that cannot be proposed as a Target of Opportunity (§5.1.5) can be requested through the DDT allocation.

Scientists wishing to request DDT can do so at any time during the year through the online DDT Proposal Submission form linked at this URL: http://ssc.spitzer.caltech.edu/geninfo/ddt/ . Requests for DDT cannot be used to submit a proposal that can be accommodated within a regular GO *Call for Proposals*. Investigators should not utilize DDT to resubmit all or part of a proposal that was rejected by the normal peer review process.

In addition to the normal DDT process the Director will make available up to 200 hours of time that the Cycle-5 Time Allocation Committee can allocate to high-risk/high-gain GO programs that have a very high science ranking. Every Cycle there are programs identified by the TAC that are very exciting but they do not end up being selected since there are ample proposals available with a better guaranteed science return even if they are somewhat less compelling. These 200 hours of DDT time may only be allocated for programs deemed high risk/high gain. The TAC may not allocate it as part of the general pool for Cycle-5.

Additional details pertaining to DDT can be found in Appendix D and on the SSC website (http://ssc.spitzer.caltech.edu/geninfo/ddt/). Abstracts of approved DDT proposals are also available at the website.

5.1.11 Data Analysis Support

For approved GO and Legacy programs the award of supporting research funds will be determined by the SSC through formulaic means. The funding formula will include terms related to the total amount of observing time awarded and the complexity of the data analysis tasks associated with the observing mode(s) utilized. Since a formulaic approach will be used to determine funding levels, *GO and Legacy investigators do not need to submit cost plans as part of their science proposal.* The same formula is used to calculate the data analysis funding, regardless of the funding instrument used to provide it.

In addition to the formulaically determined research funds, eligible Legacy programs will be awarded funds specifically for the creation and delivery of the enhanced data products described in their original proposal. This funding is determined using a separate formula from that used to calculate the data analysis funding. Successful Legacy observers will be notified of the amount of formulaically determined science data analysis funding and enhanced data products creation funding after selection. The funding for creating enhanced data products may be provided in a separate contract from the science funding. In this context, the term "data analysis" is taken to include activities that directly support the processing, analysis, scientific interpretation and publication of Spitzer data. For purposes of determining funding levels, the sum of the efforts by U.S.-based Co-Investigators on a proposal led by a foreign Principal Investigator cannot exceed 50%.

For AR and TR investigations (§5.2) specific, fixed price amounts are offered in Cycle-5. Proposers must request an even $25000 increment from $25,000-$150,000.

After the funding awards for each program are determined the principal investigator (PI) will be responsible for providing the breakdown of funds between the eligible CoIs and providing the financial contact information necessary for issuing the contracts. *In previous cycles this information was included in the proposal. In Cycle-5 it will be collected via a web form after the proposals are approved.*

Due the uncertainty in the length of Cycle-5 the total amount of NASA data analysis funding that will be available has not been determined. The SSC anticipates that the average dollars/hour provided for observing programs in Cycle-5 will be comparable to the amount provided in Cycle-4. Approximately $2 million in funds is being offered for archive and theory investigations.

Please make sure that your Sponsored Research Office has a copy of your proposal so that if it is successful they are ready to handle the funding process.

5.1.12 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**. Note that each observation (AOR) has its own proprietary period. This means that the AORs within a program are, as their proprietary periods expire, released to the public regardless of how many unobserved AORs remain in the program.** General and Guaranteed Time Observers' AORs 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 for an AOR expires, the raw and pipeline-processed data will enter the public domain and be available to anyone through the Spitzer Science Archive. Legacy General Observers have no proprietary data period. The data will enter the public domain at the same time that scientifically usable data from fully commissioned pipelines are made available to the Principal Investigator via 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 or DDT data for early release when such a release is deemed to be in the interest of the community.

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. This information should be provided in the coversheet information in the *Spot* proposal tool.

5.2 Archival and Theoretical Research Programs

The SSC will provide financial support for Investigators selected to conduct Archival (AR) and/or Theoretical (TR) Research programs, subject to the availability of NASA funds. Only PIs affiliated with U.S.-based institutions, regardless of nationality, are eligible to submit AR/TR proposals. U.S.-based Co-Investigators on approved AR/TR programs may be funded via a sub-award issued by the PI's home institution or directly by the SSC/JPL.

In previous cycles almost all of the AR/TR programs were funded with CREIs (§4.2.2.2) and the AR/TR proposals required detailed institutionally endorsed budgets. Starting with Cycle-5 AR and TR proposals are now eligible for RSAs (§4.2.2.1) therefore, budgets are no longer required.

For Cycle-5, AR and TR proposals MUST identify and request a fixed price in one of the following $25,000 increments:

$25,000 $50,000 $75,000 $100,000 $125,000 $150,000

Proposals requesting other amounts will not be forwarded to the review panels. They will be rejected outright.

The AR and TR proposals must include the following information regarding requested funding:

1. The total amount requested. This must be in one of the $25,000 increments identified above, not to exceed $150,000. *[Enter in the Spot proposal submission tool.]*
2. A high-level description of how the funds will be utilized, e.g. post-doc/graduate student support, summer salary, conference travel and page charges. *[Include in the 'Statement of Work and Schedule' (§7.4.2.3) in the Technical Plan (§7.4.2).]*
3. An itemization of the allocation of the funds between the investigators. Any funding to a given institution of less than $5,000 must be done with a sub-award from the PI's home institution. *[Include in the 'Statement of Work and Schedule' (§7.4.2.3) in the Technical Plan (§7.4.2).]*

If the AR/TR proposal is accepted for award an RSA will be issued for the specific accepted amount for eligible institutions. Organizations other than educational institutions and not-for-profits, will receive another JPL subcontract (§4.2.2.3) or direct NASA funding (§4.2.2.4).

Before you submit an AR/TR proposal make sure your institution allows you to be PI on a funded proposal. AR/TR proposals cannot propose new Spitzer observations. A separate GO proposal should be submitted if new observations are desired.

Investigators may be affiliated with universities, industry, NASA Centers, federally funded research and development centers, national laboratories, other non-profit institutes or military facilities. **Of the Cycle-5 data analysis funds ~$2 million of direct support is planned for Archival and Theoretical Research.** A total of $2,700,000 was awarded to 25 archival and 11 theoretical programs in Cycle-4.

The evaluation of AR/TR proposals will take into account the complexity of the proposed investigation and the availability of funds.

The SSC cannot award NASA supporting funds to investigators affiliated with non-U.S. institutions.

5.2.1 Archival Research Program

The Archival Research (AR) Program is an integral part of Spitzer and is expected to provide substantial scientific returns beyond the end of the prime cryogenic mission. *An AR proposal cannot propose new Spitzer observations. A separate GO proposal should be submitted if new observations are desired.* An AR proposal is submitted only if investigators are seeking funding support. For Cycle-5, financial support for archival research is available for all of the Spitzer data that will be publicly available by December 31, 2008. Proposers should anticipate that all of the Spitzer data from the Original and Cycle-2 and Cycle-3 Legacy Programs will be available, including enhanced data products returned to the SSC by these Legacy teams for distribution to the community. The data from the Cycle-4 Legacy teams should also be available although their enhanced data products are unlikely to be available for Cycle-5. Laboratory astrophysics relevant to Spitzer observations is an acceptable component of an archival proposal.

5.2.2 Theoretical Research Program

A Theoretical Research (TR) Program was first offered in Cycle-2 and is available again for Cycle-5. SSC will accept proposals to obtain support for Spitzer-related theoretical research. The proposed program should provide a lasting benefit for current or future observational programs with Spitzer.

A Theory Proposal should address a topic that is *of direct relevance* to Spitzer observational programs, and this relevance should be explained in the proposal. The results of the theoretical investigation should be made available to the community in a timely fashion. For example, models or algorithms produced should be made available to the community in addition to publishing the scientific results obtained from the models. Theoretical research should be the primary or sole emphasis of a Theory Proposal. Analysis of archival data may be included, but should not be the main aim of the project.

5.3 Guaranteed Time Observer Programs

The Spitzer Science Utilization Policies specify that following the first 2.5 years of nominal operations the fraction of science observing time allocated to Guaranteed Time Observers will be 15%. Each of the three instrument teams is assigned 5%. The GTO programs are allocated a total of 1050 hours in Cycle-5. GTOs are required to submit their proposals for the use of their time, and they do not have automatic priority in the selection of observations. The GTO proposals will be submitted, reviewed and ranked according to the same guidelines used for the GO/Legacy observing proposals. The relative ranking of GTO and GO/Legacy proposals is necessary to resolve the competition for observations in GTO and GO proposals. Duplicate observations will be awarded to the higher-ranking proposal or can be assigned to multiple teams by the TAC. The scheduling of GTO and GO/Legacy proposals will be managed by the SSC as discussed in §3.5.3.

Individual GTO teams may oversubscribe their 5% allocation so that time lost through observation duplication can be made up. The TAC will identify any GTO proposals that do not meet minimum technical standards (observatory health & safety; instrument health & safety; within documented capabilities; feasibility). These will be rejected. All GTO proposals that meet the minimum standards (established before the review by the SSC and communicated to the TAC) are approved for observation up to the maximum allocated time. After completion of the review the SSC will fill in the 5% allocated GTO time (per team) in rank order from approved GTO proposals. No post-review science modification to GTO proposals is allowed. In exceptional circumstances, SSC may allow GTO teams to select desired proposals during the post-review stage rather than follow strict rank order.

GTO proposals may not include joint observations with other observatories. The TAC will rank the proposals 'as is' and the only recommended change in a GTO proposal by the TAC should be the deletion of observations awarded to a higher-ranking proposal.

GTO programs must be submitted with complete sets of final AORs.

GTOs may also submit GO, Legacy, AR and/or TR proposals, which will be governed by the rules of competition provided for those proposal categories.

6 Proposal Planning

Before submitting a Spitzer Space Telescope Cycle-5 proposal it is important that investigators consult relevant technical documentation about the capabilities of the telescope, the sensitivities of the science instrument(s), and the nature of the pipeline-processed data delivered to investigators by the SSC. General Observer, Legacy and GTO proposals must include credible and justifiable estimates of requested observing time. *Spot*, the Spitzer observation planning and proposal submission software, and other online resources are provided for this purpose. All of these resources may be found within the Proposal Kit section of the SSC website (http://ssc.spitzer.caltech.edu/propkit).

The documentation listed in §6.1 provides details on how researchers can learn about the capabilities of Spitzer, plan and define their detailed observational program, check for possible duplicate observations, and modify their planned observations. Specific questions should be submitted electronically to the Helpdesk at help@spitzer.caltech.edu.

Prospective GO or Legacy investigators should read this entire chapter. Researchers proposing to conduct AR or TR investigations should read §6.1 -§6.4, then §6.8.

THE PROPOSAL TEMPLATES HAVE CHANGED FROM PREVIOUS CYCLES. BE SURE TO USE THE CYCLE-5 TEMPLATES FOR YOUR CYCLE-5 PROPOSALS. Proposals not using the Cycle-5 templates will be rejected outright.

6.1 Technical Documentation

The documents needed to plan, prepare and submit a proposal are listed below. General Observer (GO) and Legacy investigators are urged to read all of these documents. Archival Research (AR) and Theoretical Research (TR) proposers should follow the reading recommendations provided.

Spitzer Space Telescope Cycle-5 Call for Proposals (CP)

Version 1.0 (August 15, 2007) Required Reading: All proposers

The *Call for Proposals* is the present document.

Spitzer Space Telescope Observer's Manual (SOM)

Version 8.0 (August 15, 2007) Required Reading: All proposers

The *Spitzer Observer's Manual (SOM)* provides technical information about the telescope, including the three science instruments. It also includes information on planning, editing and submitting Astronomical Observation Requests (AORs), the user-provided specification of individual observation parameters. The SOM is an essential document for GO investigators. It will also be useful in helping Archival and Theoretical Research investigators understand how Spitzer data are collected, processed and analyzed.

Spot User's Guide

Spot version 16.3 (August 15, 2007) Required Reading: GO/Legacy/GTO (all)
AR/TR (Proposal Submission)

The *Spot* User's Guide is a comprehensive guide to the Spitzer observation planning software package (see §6.2). All proposals must be submitted using *Spot*.

Leopard User's Guide

Leopard version 7.3 (August 15, 2007) Required Reading: GO/Legacy/GTO/AR

The *Leopard* User's Guide is a comprehensive guide to the tool used to search for and download data from the Spitzer archive. Additionally, Leopard is the tool that proposers should be using to search the contents of the Reserved Observations Catalog (ROC).

Spitzer Space Telescope Observing Rules

Version 8.0 (August 15, 2007) Required Reading: GO/Legacy/GTO
Recommended Reading: AR/TR

The Observing Rules describe the rules and processes governing duplicate observations, the declaration and modification of AORs, and other policies governing Spitzer observations. This document is reproduced in its entirety as Appendix A in the *Call for Proposals*.

Spitzer Space Telescope Reserved Observations Catalog (ROC)

Version 9.0 (August 15, 2007) Required Reading: GO/Legacy/GTO/AR

The *Reserved Observations Catalog* includes an itemized list of all executed and approved observations. Proposers should use *Leopard*, the SSC archive interface software package, to query for executed or approved observations. The ROC is also available online in ASCII text format.

Spitzer Space Telescope Observation Planning Cookbook

Version 7.0 (September 15, 2007) Recommended Reading: GO/Legacy/GTO

The Observation Planning Cookbook provides detailed examples of how to construct Spitzer observations.

The documents described above are available within the Proposal Kit section of the SSC website.

The reader is urged to regularly consult the SSC Website for the latest news, technical information and telescope performance updates. The *Frequently Asked Questions (FAQ)* sections of the site, organized by topic, will be updated regularly with new questions and answers.

6.2 The Proposal Kit

The online Proposal Kit is the website that provides all of the information necessary for the prospective General Observer (GO) or Legacy researcher. It includes each of the documents listed in §6.1 and can be found on the SSC website at http://ssc.spitzer.caltech.edu/propkit/.

The Kit also includes instructions for installing *Spot*, the Spitzer observation-planning tool, on the user's host machine. *Spot* is used to plan and prepare observations, and to submit all proposals electronically to the SSC. It allows observers to construct and edit detailed Astronomical Observation Requests (AORs) by selecting from a variety of preset instrument-specific functions. *Spot* also includes useful visualization tools to permit the investigator to see

how proposed observations will be laid out on the celestial sky. These capabilities allow users to retrieve relevant images from other astronomical surveys and archives. It also describes how an investigator can obtain estimates of observing time for a proposed program.

Prospective GO/Legacy investigators are strongly encouraged to download *Spot* and to start planning their observing programs well before the proposal submission deadline. Version S16 of Spot, required to submit your proposal, is now available. Please allow Spot to auto-update to the latest version, if you haven't already.

Spot allows prospective investigators to plan, develop and modify their proposal in an iterative manner. That is, a proposer can write a portion of their proposal and define their accompanying AORs, save the results locally, and then re-load those results at a later time for subsequent modification. The saved cover sheet information, proposal text and AORs can be modified repeatedly until the proposal is submitted to the SSC. The proposal can be resubmitted or updated at any time before the proposal deadline.

A separate section of the online Proposal Kit contains information specifically designed for Solar System researchers. It includes asteroid count estimates and tips for utilizing the HORIZONS database supported by the Solar System Dynamics Group at the Jet Propulsion Laboratory.

The Proposal Kit includes an Infrared Compendium, an online resource for professional scientists new to infrared astronomy. The Proposal Kit also contains a multitude of links to useful general-purpose astronomical tools (such as coordinate conversion), observation planning tools (e.g. IRSKY, Skyview), astronomical databases (e.g. IRSA, NED, SIMBAD) and archived datasets (e.g. 2MASS, ISO, DSS).

6.3 GTO Observations

The Spitzer Guaranteed Time Observation (GTO) program results from a 1983 *NASA Announcement of Opportunity* and competitive selection of instrument teams and the Science Working Group. The GTOs were allocated 20% of the available observing time for the first 2.5 years of the cryogenic science mission, and 15% thereafter. The GTO project abstracts and itemized observations for the first 2.5 years are included in the *Reserved Observations Catalog (ROC)*, which accompanies this CP and is available online at the SSC website.

The Guaranteed Time Observers who built the Spitzer focal plane instruments will be submitting proposals to utilize their 15% of guaranteed time in Cycle-5 (see §5.3).

6.4 Legacy Science Program

The Spitzer Legacy Science Program consists of *large and coherent science projects*, not reproducible by any reasonable number or combination of smaller GO investigations; they are projects of *general and lasting importance* to the broad astronomical community, with the Spitzer observational data yielding a *substantial and coherent database*; and they are projects whose raw and pipeline-processed *data enter the public domain immediately upon SSC*

processing and validation, thereby enabling timely and effective opportunities for follow-on observations and for archival research, with both Spitzer and other observatories. The Program was motivated by a desire to enable major science observing projects early in the mission, with the goal of creating a substantial and coherent database of archived observations that can be utilized by subsequent Spitzer researchers, including General Observers. Seven Legacy Programs were selected in Cycle-4.

Additional details pertaining to the Legacy Science Program are available in Appendix C and online at http://ssc.spitzer.caltech.edu/legacy including extended abstracts, links to science articles and the Legacy Teams websites. Also see the SSC publication archive (http://ssc.spitzer.caltech.edu/pubs/) for more information.

6.5 Additional Guidelines for Observers

This section contains additional guidelines and policies that investigators must know as they plan their GO, Legacy or GTO proposal.

6.5.1 Duplicate Observations

In general, duplicate observations with the Spitzer Space Telescope are not permitted. *It is the responsibility of the investigator to avoid duplication of previously approved observations.* A list of all such observations is available in the *Reserved Observations Catalog* (ROC). The ROC lists all observations approved or executed to date. The Proposal Kit contains the ROC in text format. Observers should use *Leopard*, the SSC Science Archive interface software to search all planned and executed observations.

Quantitative descriptions of what constitutes a duplicate observation can be found in the Spitzer Observing Rules (Appendix A, §14.2). The duplication criteria are a function of celestial coordinates, areal coverage on the sky and Spitzer sensitivity. Under special circumstances properly justified by the proposer, new AORs judged to duplicate previously approved observations may be approved by the SSC Director. For examples of scientifically justified observations that are formally duplicate observations, the reader should consult Appendix A (§14.2.1). Generally, when such an observation is approved, the data will be embargoed until the proprietary period of the prior observations expires.

Proposed AORs deemed to duplicate previously approved observations specified in the *Reserved Observations Catalog (ROC)* will be identified by the SSC (hereafter called GO5-ROC duplications). This information will be forwarded to the peer reviewers. If no justification is provided for the duplication, the reviewers will be instructed to omit GO5-ROC duplicate observations and to assess the proposal's merits excluding them. The SSC Director may approve the execution of justified GO5-ROC duplicate observations as discussed in the previous paragraph.

The SSC will also attempt to identify observations in proposals that do not duplicate anything in the ROC but do overlap with other proposals received in response to the Cycle-5 CP (hereafter called GO5-GO5 duplications). This information will be provided to the peer reviewers to use in their assessment of the proposals. The final program recommended by the TAC and approved by

the SSC Director may include programs with GO5-GO5 duplications. These observations will in general be executed by the SSC as approved.

6.5.2 Constrained Observations

Constraints placed on proposed observations must be explicitly stated and accompanied by a compelling justification. Apart from the obvious constraint of sky visibility (§3.2), there are various means by which an observer may place scheduling and relational constraints on proposed observations (see §5.5.3 of the *Spitzer Observer's Manual* for details). Constraints limit the flexibility of telescope scheduling and reduce the overall observing efficiency. Therefore, proposers should carefully consider the impact of constrained observations. The SSC discourages investigators from placing undue constraints on proposed AORs***. Programs with heavily constrained AORs will be identified as difficult to schedule by the SSC, and their evaluation will be affected accordingly (see §8.2).***

Use constraints only if the science requires it, since the more robust and flexible the observations and/or constraints are, the greater the chance of them being scheduled in a timely manner. **Any scheduling constraint imposed on an AOR will increase the difficulty of scheduling the AOR. Highly constrained observations are at significant risk of non-execution in Cycle-5.**

In previous cycles a few programs were identified with timing constraints that had no scientific justification. If you are tempted to apply constraints in Cycle-5 simply to influence when the observations are scheduled, don't do it. If your program is identified as having 'schedule-influencing' constraints the constraints will be deleted and the program will be given a lower scheduling priority.

The SSC does encourage observers to use loose constraints when this substantially enhances the science. For example, a loose sequence or group-within constraint can be used to ensure that mapping AORs are done at a similar orientation. These are not difficult to support and will result in better science than mapping AORs that are completely unconstrained. Using chain constraints, multiple follow-ons, and short timing constraints can make your observations very difficult or even impossible to schedule. Use the minimum number of constraints that you need for your science and provide a clear justification in the proposal. As a rule of thumb any constraint that involves a time range should be twice as long as the AORs you want scheduled within the time range. For example, if you have 10 hours of mapping AORs any timing or grouping constraints should allow a ***minimum*** of 20 hours for their execution.

Observing constraints must be specified in *Spot* and justified in the proposal text.

6.5.3 Calibration Observations

The SSC establishes and maintains the calibration of each science instrument to levels specified in the *Spitzer Observer's Manual.* Data resulting from these routine calibrations will generally enter the Science Archive upon processing and validation by the SSC.

The initial on-orbit calibration of the telescope was performed as part of the commissioning of each observing mode (or AOT, see §3.4). 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.

For investigations that require a higher level of calibration, it is the responsibility of the Principal Investigator to include those *special calibrations* as part of their proposal. The SSC will process such observations through its normal data processing pipeline(s), and the data will be subject to the normal proprietary data periods (§5.1.12).

6.5.4 Bright Object Observations

Given the unprecedented sensitivity of Spitzer, it is perhaps not surprising that bright objects affect the detector arrays. Much of the Galactic Plane, for example, will saturate the MIPS 160-micron arrays. While saturation will not permanently damage the detector arrays, latency effects will compromise subsequent observations.

Proposals that involve observations of bright sources will not be precluded. However, investigators should be aware of infrared sources that may saturate the Spitzer detectors, whether they are the intended target, or whether their celestial position is near the proposed target. Scheduling of observations of bright sources so as not to impact other programs has become a scheduling issue.

Programs with substantial numbers of bright targets (http://ssc.spitzer.caltech.edu/documents/brightobj/) will be identified as difficult to schedule by the SSC, and their evaluation will be affected accordingly.

The SOM provides current estimates of the saturation limits for each wavelength. A list of bright celestial sources likely to exceed the saturation limits is provided in the online Proposal Kit. *Spot* also has a bright object search feature to check for bright objects near your target(s). Note that the SSC reserves the right to exclude some targets as a result of impacts that these bright objects might have on subsequent observations. Observers proposing observations of bright objects should discuss their impact in the technical plan.

6.6 Moving Target Ephemerides

The online Proposal Kit (http://ssc.spitzer.caltech.edu/propkit) contains a section specifically designed to support Solar System researchers. It includes asteroid count estimates and tips for utilizing the HORIZONS database supported by the Solar System Dynamics Group at the Jet Propulsion Laboratory.

To obtain an accurate estimate of the observing time required for your moving target observation, an ephemeris file for your target must be installed at the SSC. *Spot* can query the HORIZONS database at JPL for an ephemeris file if the SSC does not have the file installed locally. Spot will do this when you do a visibility calculation or calculate resource estimates. There is a slightly longer delay (on the order of ~5 seconds during 'normal' periods) for this transaction to occur. **Proposers no longer need to provide to the SSC a list of NAIF IDs of moving targets for which an ephemeris file is needed**. As with all internet-based resources,

there are likely to be peak demand periods and times when the resource is not available due to unforeseen events. Proposers are encouraged to start early in planning their observations.

We note also that ephemerides can have large intrinsic errors, and the ensuing positional errors can be sufficiently large that the object has a very low probability of being acquired by Spitzer. We therefore *strongly* recommend that the observer check the available positional accuracy for a Solar System target before proposing to observe it with Spitzer. Instructions on how to do this can be found in the Horizons documentation in the Solar System section of the online Proposal Kit (http://ssc.spitzer.caltech.edu/propkit).

6.7 Baseline Instrument Campaign

The normal operating schedule for the instruments on Spitzer is contained in the Baseline Instrument Campaign (BIC). Spitzer operates the instruments in the order IRAC-MIPS-IRS and then starts again with IRAC. Only ToO observations may interrupt this ordering. We anticipate that the spacing of campaigns for each instrument in Cycle-5 will be approximately 35 days (the same as in Cycle-3 and Cycle-4) with each instrument on for 7-21 days. As discussed in §3.5.1, MIPS observations will be segregated into 'warm' and 'cold' campaigns.

6.8 SSC Assistance

All questions of a scientific, technical, programmatic or financial nature should be submitted electronically to the Spitzer Science Center Helpdesk (*help@spitzer.caltech.edu*). The SSC is committed to answering all questions as rapidly as feasible, and normally within two business days from the receipt of a query. Note that as the proposal deadline approaches, the turnaround times for an SSC response (particularly for definitive answers to complex technical questions) will likely increase. It is the responsibility of proposers to take this reality into consideration when submitting queries shortly before the proposal submission deadline.

Questions and answers deemed by the SSC to be of interest to the broader community will be archived as an anonymous Frequently Asked Question (FAQ) on the SSC website. Therefore, all questions and comments submitted to the Helpdesk become the property of the SSC and California Institute of Technology.

7 Proposal Submission

The Spitzer Cycle-5 submission process is one phase for small proposals. GO investigators proposing a small Spitzer program are required to submit all of their completed Astronomical Observation Requests (AORs) with their science proposal. Statistical programs (§5.1.8) should include AORs for all possible targets. *These AORs should be the final set you expect to have executed if the proposal is successful.* GO/Legacy investigators proposing a medium or large Spitzer program must submit representative AORs that clearly define their observations, but are not required to submit the entire program of AORs with their proposals. These proposals must include complete target lists and descriptions of the observations. If successful, the final AORs for the program must be submitted to the SSC within four to six weeks of notification of the awarded time.

All GTO proposals must be submitted with a complete set of AORs.

All categories of proposals must be submitted through *Spot*, a downloadable software package developed by the SSC. The AORs and cover sheet information are entered directly into *Spot* for transmittal. ***The science justification and all other required elements must be submitted as a single PDF file attachment.*** The AORs and cover sheet information created in *Spot* can be saved as text files on your local computer. The cover sheet information, the proposal PDF file and the AORs are all submitted electronically via *Spot*. ***Cycle-5 proposals must be submitted with the S16 version of Spot which is currently available to download from the Proposal Kit website.***

There is no limit to the number of proposals that may be submitted by a Principal Investigator or by Co-Investigators. Proposals should not contain classified information or depend on access or use of classified information or facilities for any portion of the proposed activities. The Principal Investigator may withdraw a proposal from consideration at any time prior to the completion of the selection process.

Cycle-5 proposal PDF files must be prepared with the SSC provided Cycle-5 templates. The templates are available in Latex and Microsoft Word formats in the online Proposal Kit. Proposals not using the Cycle-5 templates will be rejected outright.

7.1 Proposal Submission Deadline

The proposal submission deadline is:

Friday, November 16, 2007 (5:00 pm PST)

Proposals must be submitted prior to the deadline. Proposals received after the deadline will not be considered. **The proposal submission deadline is firm**. If you need information from a source outside of the SSC that you do not directly control, particularly a service available via the Internet, then obtain this information well in advance of the deadline. There are periodic slow-downs in Internet service due to Internet worms, viruses, etc. Disks crash and computers are hacked. **Please plan your submission with these factors in mind because the submission deadlines will not be moved.**

If you experience computer or Internet problems just prior to the deadline such that you are not able to submit your proposal by 5:00 pm, do not wait for 3 or 4 hours to contact us. Call us at 626 395-8000 (SSC central phone line) before the deadline and let us know.

You may resubmit your proposal as many times as you want prior to the deadline. You must use the *Spot* software to submit your proposal electronically. No proposals will be accepted on paper. If the SSC servers have started (or completed) processing of your proposal when the deadline is reached, the proposal will be accepted. There will be a clock on the SSC website that tells you what time it is at the SSC and you can therefore accurately gauge when the deadline is.

Paper copies of institutionally endorsed cost-plans are no longer required for AR/TR proposals.

7.2 Proposal Formats

7.2.1 Cover Sheet

For all proposals the Cover Sheet information is entered into *Spot* and then submitted electronically to the SSC. This information can be saved to your local computer as a text, PDF or html file. We recommend that all proposers start early. You can update the cover sheet information from *Spot* as many times as necessary prior to the proposal deadline.

7.2.1.1 Science Category

An important piece of information that is provided in the Cover Sheet is the **Science Category.** All proposals must include one, and only one, science category. This information is used to distribute the proposals to the panels for the review. Please select the science category that best describes your proposal. The categories are divided into three broad groups: extragalactic, Galactic and solar system. The solar system category is for OUR solar system. If your proposal is related to other solar systems, please select one of the Galactic categories, e.g. extra-solar planets. The Galactic group includes a category for proposals that are doing detailed stellar studies outside of our Galaxy. These proposals have historically ended up in extragalactic panels while the best expertise to review them is in the Galactic panels.

7.2.2 Astronomical Observation Requests (AORs)

The submission of Astronomical Observation Requests (AORs) is required for observing proposals. GO investigators proposing *small* Spitzer programs are required to submit all of their completed AORs with their proposal. GO investigators proposing a *medium, large, or Legacy* program must submit representative AORs that clearly define all of their observations, but are not required to submit the entire program of AORs with the proposal. GTO investigators must submit a complete set of AORs. No AORs are submitted for AR/TR proposals.

AORs are created in *Spot* and then submitted electronically to the SSC. You create your AORs and save them to a text file on your local computer. When you are ready to submit the proposal, load the AORs into *Spot* and they will be automatically transmitted with the cover sheet and PDF attachment to the SSC. The cover sheet information, PDF attachment, and AORs can all be updated separately or all at once after your initial submission.

7.2.3 PDF Attachment – Page Limits

Templates in Latex and Microsoft Word formats are provided on the SSC Proposal Kit web page (http://ssc.spitzer.caltech.edu/propkit) and MUST be used to prepare your PDF attachment.

The Cycle-5 templates must be used to prepare your Cycle-5 proposal. Proposals not using the Cycle-5 templates will be rejected outright.

The page limits for each section in the PDF attachment depend on the proposal category as described in §5.1 and §5.2. Relevant page limits for each proposal category are summarized in the table below.

Proposals that exceed the page limits may be edited by the SSC, and the excess pages deleted or flagged for the peer reviewers as not meeting the section page limits. In previous cycles some proposals with flagrant violations of the page limits, font size, etc. were deemed 'not responsive to the Call for Proposals' by the panels and were rejected without review.

The page limits for proposals are:

	Science Just.	Technical Plan	Data Prod. Plan	Figures/ Tables	Refs.	Res./ Bibl.
Legacy	**4**	**3**	**1**	**2**	**1**	**1**
Medium/Large	**4**	**3**	**0**	**2**	**1**	**1**
Small & AR/TR	**3**	**2**	**0**	**2**	**1**	**1**

Observers proposing Joint Observations are allowed one additional page in the Technical Plan for each joint observatory requested. For example, if NOAO and NRAO observations are requested then the technical plan can include one additional page for the NOAO observations and one for the NRAO observations. The necessity of the joint observations should be included in the scientific justification.

Additional pages allowed for each joint-observatory requested						
Joint	**+0**	**+1**	**+0**	**+0**	**+0**	**+0**

The following table summarizes additional information that is *required but not subject to the page limits* specified above.

Content	**Required Proposal Categories**
Summary of Existing Spitzer Programs	**all proposals**
Observations Summary Table	**all observing proposals**
Modification of Proprietary Period	**all observing proposals**
Justification of Duplications	**all observing proposals**
Justification of Scheduling Constraints	**all observing proposals**

Additional details pertaining to proposal contents are listed in §7.3-7.4. All proposals must be written in English and a printable version must utilize fonts that are ***no smaller than 12 point, and must adopt one-inch margins on all sides on 8.5 × 11-inch paper***. Color figures or tables can be included but the SSC will only reproduce proposals in black-and-white. *The PDF file size limit for submission is 10 megabytes, so extremely large or complex color figures may not be acceptable.* No preprints or reprints should accompany the proposal as they won't be forwarded to the review panels.

Proposals will be provided to each panel and TAC reviewer as PDF files on a CD-ROM. It is the responsibility of the proposer to ensure that their PDF file is legible when opened with

Acrobat Reader. Please see http://ssc.spitzer.caltech.edu/documents/makepdf.html for instructions on making legible PDF files.

All investigators should recognize that the peer review process (§8) utilizes external scientists organized into topical Review Panels. Reviewers are selected such that their expertise reflects the proportional mix of proposals submitted in previous cycles. A given Review Panel will necessarily span a wide variety of research disciplines. *Therefore, proposals should be written for a knowledgeable, but broad-based, audience.* For Cycle-5 we plan to have 12 panels -- 6 Galactic, 5 extragalactic and 1 for our solar system. The extragalactic panels are subdivided into nearby and distant universe categories. The Galactic panels are subdivided into stars & the ISM and star & planet formation categories. **The science category you select in *Spot* to characterize the science in your proposal will determine which panel reviews it.** Proposals will be evaluated according to the criteria listed in §8.2.

Additional guidelines for all observing proposals are provided in the following sub-sections.

7.3 Observing Proposal Contents

Observing proposals must include the following sections, each subject to the individual page limits listed in §7.2. The required proposal templates are available from the Proposal Kit website. Proposals not using the Cycle-5 templates will be rejected outright. The required sections (except the AORs) must be combined into a single PDF file for submission with *Spot*.

7.3.1 Science Justification

Proposals must include a clear statement of observing goals and describe the general importance of the proposed project to the astronomical sciences. It should address why the Spitzer capabilities are uniquely important in advancing knowledge in the proposed area of research. The science plan and its underlying rationale should be readily comprehensible to broad-based scientists. It must include a justifiable and reasonably accurate request for observing time for each observing mode. The observing time requests must be based on the resource estimates calculated with *Spot*, the SSC proposal planning and submission software. All Joint proposals must provide a full and comprehensive scientific justification for the requested observing time. Figures and tables should be segregated onto separate pages and not embedded in the text.

Any pages labeled Science Justification that exceed the page limits described in §7.2.3 may be deleted before the proposal is sent to the reviewers.

7.3.2 Technical Plan

The technical plan must include a description of the proposed observing strategy, with information about target selection and the choice of observing modes. For all observations the technical plan must include quantitative descriptions of the required sky/target position(s), expected target flux densities or surface brightness, required sensitivity/depth (1-sigma noise or S/N ratio), wavelength(s), and coverage strategy (including redundancies). For spectroscopic observations, the proposal must also include the positional accuracy needed and the strategies by which targets will be acquired. The technical plan should also show that the proposers have checked the sky background brightness and saturation issues for their observations and provide the maximum expected flux densities or surface brightness in the fields of view or spectral

slits/apertures. For projects conducting photometric measurements, the proposal must define the photometric accuracy needed and any special calibration requirements. For other types of observations, similar levels of technical detail should be specified.

All flux densities and surface brightness must be provided in correct flux units:

Point Sources	**IRAC, MIPS, IRS**	**micro-Jy, milli-Jy, or Jy**
	or IRS	**W × m^{-2}**
Extended Sources	**IRAC, MIPS, IRS**	**MJy × sr^{-1}**
	or IRS	**W × m^{-2} × sr^{-1}**

In all cases, the target list for Spitzer observations must be adequately justified and explained. Investigators should describe why the proposed targets were selected, and any assumptions made about their targets and/or sample. Telescope and scheduling constraints placed by investigators on proposed observations must include compelling scientific justification (§6.5.2). Observers proposing observations of bright objects (§6.5.4) should discuss their impact in the technical plan.

The technical plan should also include a data analysis plan. Descriptions of the instrument-specific pipelines can be found within Chapters 6-8 of the *Spitzer Observer's Manual*, in the instrument-specific *Data Handbooks* and also the *Pipeline Description Documents*. Figures and tables should be segregated onto separate pages and not embedded in the text.

Any pages labeled Technical Plan that exceed the page limits described in §7.2.3 may be deleted before the proposal is sent to the reviewers.

Up to one additional page for each observatory is allowed in the technical plan for Joint Observatory proposals requesting observations from NOAO and/or NRAO.

Statistical programs (§5.1.8) should be explicitly declared and described in the technical plan. Proposers should explain how the sub-sample, rather than the complete sample, of targets is useful for achieving their science goals.

7.3.2.1 Joint Spitzer-NOAO Observations

Proposers requesting joint Spitzer-NOAO observations must provide a full and comprehensive technical justification for the NOAO portion of their program. This justification must include:

- the telescope(s) and instrument(s) on which time is requested,
- the requested observing time per telescope/instrument, a specification of the number of nights for each semester during which time will be required, a breakdown into dark, grey and bright time, and an explanation of how the required exposure time was estimated,
- information on whether the observations are time-critical; indicate whether the observations must be coordinated in a way that affects the scheduling (of either the NOAO or the Spitzer observations),
- a description of any special scheduling or implementation requirements (e.g., optimum and acceptable dates).

Successful proposers will be asked to supply additional details about the observations, i.e., the same details required for NOAO proposals for the particular telescope/instrument. Submission instructions will be forthcoming following notification of the results of the Spitzer review.

Technical documentation about the NOAO facilities is available from the NOAO Website. Questions may be directed to the NOAO Proposal Helpdesk at *noaoprop-help@noao.edu*. NOAO will perform feasibility checks on any approved proposals. Proposers requesting joint Spitzer-NOAO observations must specify whether they were recently (in the last two years) awarded NOAO time for similar or related observations.

7.3.2.2 Joint Spitzer-NRAO Observations

Proposers wishing to make use of this opportunity must provide the following additional NRAO-related information as part of their Spitzer proposal:

1. Indicate the choice of NRAO telescope(s) (VLA and/or GBT).
2. For the VLA, indicate the requested configuration(s) (dates of availability for the configurations are at http://www.vla.nrao.edu/genpub/configs).
3. Enter the total estimated observing time and the observing frequency(ies) for each telescope/configuration.

The first trimester in which observations could be executed is October 2008 to January 2009. Demonstration of the technical feasibility of the proposed NRAO observations is the responsibility of the proposer. The basic technical feasibility will be reviewed by NRAO before the proposal is evaluated. Detailed technical information concerning the VLA and the GBT can be found at http://www.vla.nrao.edu/astro (VLA) and at http://www.gb.nrao.edu/gbtprops/man/GBTpg.pdf (GBT). In particular, note the comprehensive "Observational Status Summary" for the VLA and the description of instrumentation and observing modes for the GBT.

If approved for NRAO time, successful PIs will be required to submit the standard NRAO forms providing detailed observing information appropriate to the telescope and instrument combination(s) awarded. NRAO will perform final feasibility checks on the proposed observations based on the information provided on these forms and reserves the right to reject any observation determined to be infeasible for any reason. Proposals whose observing requests for NRAO facilities are inconsistent between the cover sheet and the scientific justification may be rejected, due to the short time period available to notice and then reconcile these inconsistencies.

7.3.3 Data Products Plan – Legacy General Observer Proposals

Legacy proposals should include a one-page plan that outlines the enhanced data products that they will create for their program, e.g. image mosaics, catalogs, spectra and documentation. The plan should include a high level schedule for when the products will be delivered. These data deliveries are generally tied to when the data are available in the archive. This section is ONLY allowed for Legacy proposals. Regular GO/GTO programs should leave in blank.

7.3.4 Other Contents

7.3.4.1 Figures and Tables

Up to two pages of figures and tables may be included in the proposal. These should be consolidated into two separate pages and appear after the Science Justification and Technical Plan. The Observation Summary table required for all observing proposals is not included in this page limit (it is a separate section, see below). Color figures or tables can be included but the SSC will only reproduce proposals in black-and-white. They should be of adequate size to comprehend. *The PDF file size limit for submission is 10 megabytes so extremely large or complex color figures may not be acceptable.* Figure captions and tables may be listed in 10-point font (rather than 12-point).

7.3.4.2 Observation Summary Table

An Observation Summary Table is required for all observing proposals: GO, GTO and Legacy.

The Observation Summary Table is not subject to the proposal page limits. For each proposed observation the table must include all target position(s), AOTs (e.g. IRAC Mapping, MIPS Scan), imaging arrays (e.g. 24 microns) or IRS modules and integration time per array/slit, and estimated source flux. The background flux, sensitivities and depth reached should be included in the technical plan and can optionally be included here. Targets of Opportunity and their impact classification (§5.1.5) should also be specified in the table. All flux densities and surface brightnesses must be provided in correct flux units:

Point Sources	IRAC, MIPS, IRS	micro-Jy, milli-Jy, or Jy
	or IRS	$W \times m^{-2}$
Extended Sources	IRAC, MIPS, IRS	$MJy \times sr^{-1}$
	or IRS	$W \times m^{-2} \times sr^{-1}$

A Perl script that parses information from the AOR file into a format that can be reformatted into a table is available in the Proposal Kit.

As discussed in §5.1.8 the SSC will accept ‘statistical programs’ in Cycle-5 where a specific number of observations are required for the science but the set of observations required is not unique. For example if your program requires observations of 10 targets in your sample and you have 20 targets total in the sample the proposal can be submitted with AORs specifying observations of 20 targets but time is only requested to observe 10 of them. All of the targets submitted in the AORs should be described in the Observation Summary Table.

7.3.4.3 References

Up to one page of references may be included in the proposal. References may be listed in 10-point font (rather than 12-point).

7.3.4.4 Brief Resume and Bibliography

One additional page should be devoted to brief qualifications of the Principal Investigator and summary bibliographies of key investigators. This page should list the major publications related to the proposed research.

7.3.4.5 Existing Observatory Programs

Proposers must explicitly summarize their current involvement as a Principal Investigator or Technical Contact on existing Spitzer Space Telescope research programs. This applies to the PI and principal CoIs on the proposal. The proposer should indicate the status of each GTO, GO, Legacy, DDT, Archival or Theoretical program and any publications resulting from the program(s). For observing programs, include the status of the data analysis effort.

Proposers that are the PI/Technical contact for five or more current Spitzer programs (e.g., the GTOs) are not required to provide a detailed status for every program. They should provide a summary that includes the number of programs, overall status (e.g. 75% observed, 50% data analysis complete, 20 papers published, 20 papers submitted, etc.) that will allow the reviewers to understand the state of the programs.

Proposers requesting joint observations must specify whether they were awarded time in a previous cycle for similar or related observations at the relevant observatory.

7.3.4.6 Data Analysis Funding Distribution & Financial Contact Information

These two sections no longer exist in the proposal templates.

The SSC is moving toward a web-based User Community funding contract management system. For Cycle-5 the SSC will collect this information after the proposals are selected. If your proposal is approved the SSC will contact you and provide detailed instructions.

7.3.4.7 Modification of Proprietary Period

If any reduction of the standard proprietary period is proposed, please specify that in this section. There is a field specifying the proprietary period in the *Spot* Proposal Tool. Any modifications should also be entered there. The standard period for GO/GTO programs is 365 days and for Legacy programs it is 0 days. Note that each observation (AOR) has its own proprietary period. This means that the AORs within a program are, as their proprietary periods expire, released to the public regardless of how many unobserved AORs remain in the program.

7.3.4.8 Justification of Duplicate Observations

Briefly summarize the justification for any proposed duplicate observations. The details should have been provided in the science justification.

7.3.4.9 Justification of Scheduling Constraints

Briefly summarize the justification for any proposed scheduling constraints. The details should have been provided in the science justification and technical plan.

7.3.5 Astronomical Observation Requests (AORs)

Each *small* GO proposal must be accompanied by a complete list of Astronomical Observation Requests (AORs). Statistical programs (§5.1.8) should include a complete set of AORs for all possible targets. The submitted AORs should be the final ones you expect to have executed if the proposal is successful. *Medium*, *large* GO and Legacy proposals must submit representative AORs that fully encompass the proposed observations. GTO proposals must submit a complete set of AORs.

All AORs are created in *Spot* and submitted electronically to the SSC. The AORs that you have loaded in *Spot* at the time you are submitting your proposal are AORs that will be transmitted to the SSC and stored in our database. Do not include the AORs as text in the proposal PDF file.

You can create or edit your AORs in *Spot* at any time prior to submitting or updating your proposal. They can be saved as an ASCII text file on your local computer and then reloaded for editing or submission at a later time. The AORs include the total time required to execute a given observation with the telescope. **Each AOR includes an assessed overhead of 215 seconds to account for the average time required to acquire the target, regardless of the actual time utilized.** The average acquisition time is based on our experience to date. **Each moving target AOR is assessed an additional 300 seconds (515 seconds total) overhead per AOR.** Moving target AORs require an additional 5 minutes to execute compared to an identical fixed target AOR. This has always been a feature of Spitzer scheduling but the additional overhead was not taken into account in previous versions of Spot. Spot now automatically adds in the additional overhead for moving target AORs.

Additional overheads are assessed for high- and medium-impact Targets of Opportunity and for observations requiring rapid instrument turnarounds or late ephemeris changes (see Appendix E and the *Spot User's Guide*). **Failure to include these overheads in the preparation of AORs may result in disqualification of the program during its SSC technical review**. It is the responsibility of the proposer to ascertain the completeness and correctness of their AORs. The special overhead must be specified using *Spot* when the AORs for the proposal are created. From within the relevant AOR dialog click the **Special …** button and select the appropriate overheads from the list. *Spot* will calculate the required time and add it to the Total Duration returned on the main *Spot* AOR page. If you have questions about the application of special overheads, please contact the Helpdesk BEFORE the proposal deadline.

Providing robust, ready-to-execute AORs with your proposal is the fastest way to ensure that your observations get quickly into the scheduling pool. ***Observers approved for Cycle-5 will not, in general, have any opportunity to make major modifications (see §14.4.1) to their AORs after selection. Proposers are urged to carefully plan and construct the AORs that accompany their proposal.***

7.4 Archival & Theoretical Research Proposal Contents

For Cycle-5, AR and TR proposals MUST identify and request a fixed price in one of the following $25,000 increments:

$25,000 $50,000 $75,000 $100,000 $125,000 $150,000

Proposals requesting other amounts will not be forwarded to the review panels. They will be rejected outright.

Archival Research (AR) and Theoretical Research (TR) proposals must be submitted to the SSC electronically using *Spot*, the SSC proposal planning and submission software. AR proposals may propose analysis of any data expected to be publicly available in the Spitzer Science Archive by December 31, 2008. AR and TR proposals must include the sections described below, each subject to individual page limits listed in §7.2. The required proposal templates are available from the Proposal Kit website. Proposals not using the Cycle-5 templates will be rejected outright. These sections must be combined into a single PDF file for submission with *Spot*.

Proposals will be provided to each panel and TAC reviewer as PDF files on a CD-ROM. It is the responsibility of the proposer to ensure that their PDF file is legible when opened with Acrobat Reader. Please see http://ssc.spitzer.caltech.edu/documents/makepdf.html for instructions on making legible PDF files.

Any pages that exceed the page limits described in §7.2.3 may be deleted before the proposal is sent to the reviewers.

7.4.1 Science Justification

7.4.1.1 Archival Research

The Scientific Justification for AR proposals must include a clear and complete statement of the investigation's science goals. The science plan and its underlying rationale should be readily comprehensible to broad-based scientists. The proposer should describe how the results of the investigation will be made available to the community in a timely manner.

7.4.1.2 Theoretical Research

The Scientific Justification section of the proposal should describe the proposed theoretical investigation and also its impact on observational investigations with Spitzer. The proposal must include a clear and complete statement of the investigation's science goals. Review panels will consist of observational and theoretical astronomers with a broad range of scientific expertise. They will not necessarily have specialists in all areas of astrophysics, particularly theory, so the proposals should be written for a general audience.

A Theoretical Proposal should address a topic that is of *direct relevance* to Spitzer investigations, and this relevance should be explained in the proposal. The results of the theoretical investigation should be made available to the community in a timely fashion. For example, models or results from modeling should be made available to the community. Theoretical research should be the primary or sole emphasis of a TR Proposal. Analysis of archival data may be included, but should not be the main aim of the project. The program should provide a lasting benefit for current or future observational programs with Spitzer.

7.4.2 Technical Plan

7.4.2.1 Archival Research

The technical plan should describe the data analysis plans of the AR investigator. It should describe the extent to which the SSC pipeline-processed data contribute towards achieving the stated scientific goals of the investigation, and the extent to which post-pipeline data analysis must be performed by the investigator. Descriptions of the instrument-specific pipelines can be found within Chapters 6-8 of the *Spitzer Observer's Manual* and instrument-specific *Data Handbooks*.

7.4.2.2 Theoretical Research

The Technical Plan section of the proposal should discuss the types of Spitzer observations that will benefit from the proposed investigation, and references to specific data sets in the Spitzer Data Archive should be given where possible. This section should also describe how the results of the theoretical investigation will be made available to the astronomical community, and on what time scale the results are expected.

7.4.2.3 Statement of Work and Schedule

This subsection of the technical plan for Archival and Theoretical proposals must include:

1. A high-level description of the planned work and how the funds will be utilized, e.g. post-doc/graduate student support, summer salary, conference travel/page charge support.
2. An itemization of the allocation of the funds between the investigators. Any funding to a given institution of less than $5,000 must be done with a sub-award from the PI's home institution.
3. A schedule for any promised deliverables.

7.4.3 Figures and Tables

Up to two pages of figures and tables may be included in the proposal. These should be consolidated into two separate pages and appear after the Science Justification and Technical Plan. Color figures or tables can be included but the SSC will only reproduce proposals in black-and-white. They should be of adequate size to comprehend. *The PDF file size limit for submission is 10 megabytes so extremely large or complex color figures may not be acceptable.* Figure captions and tables may be listed in 10-point font (rather than 12-point).

7.4.4 References

Up to one page of references may be included in the proposal. References may be listed in 10-point font (rather than 12-point).

7.4.5 Brief Resume and Bibliography

One additional page should be devoted to the brief resume of the Principal Investigator and summary bibliographies of key investigators. This page should list the major publications related to the proposed research.

7.4.6 Existing Observatory Programs

Proposers must explicitly summarize their current involvement as a Principal Investigator or Technical Contact on existing Spitzer Space Telescope research programs. This applies to PIs and principal CoIs. The proposer should indicate the status of each GTO, GO, Legacy, Archival or Theoretical program and any publications resulting from the program(s). For observing programs, include the status of the data analysis effort.

Proposers that are the PI/Technical contact for five or more current Spitzer programs (e.g., the GTOs) are not required to provide a detailed status for every program. They should provide a summary that includes the number of programs, overall status (e.g. 75% observed, 50% data analysis complete, 20 papers published, 20 papers submitted, etc.) that will allow the reviewers to understand the state of the programs.

7.4.7 Financial Contact Information & Cost Plan

These sections no longer exist in the proposal templates.

The SSC is moving toward a web-based User Community funding contract management system. For Cycle-5 the SSC will collect this information after the proposals are selected. If your proposal is approved the SSC will contact you and provide detailed instructions.

7.5 Submission of Proposals

Proposals must be submitted to the SSC electronically through *Spot*, the Spitzer observation planning software (*Spot*; see §6.2), and must be consistent with the page and format guidelines listed throughout §7. The PDF file must be created using one of the templates available at the Proposal Kit website. Proposals not using the Cycle-5 templates will be rejected outright. Detailed instructions on using the software are available in the *Spot User's Guide*, and are summarized below.

7.5.1 Submitting your Proposal for the First Time

1. Download *Spot* from the Proposal Kit section of the SSC website (http://ssc.spitzer.caltech.edu/propkit) and install it on your host machine. Use the S16 version of *Spot*, which is currently available.
2. Download a proposal template from the Proposal Kit website and use it to create the proposal PDF file.
3. Start up *Spot* and open the Proposal Tool (Tools -> Proposal Tool). Allow *Spot* to auto-update to the latest version.
4. Enter the coversheet information into the proposal tool, or load any previously generated cover sheet information.
5. Select the correct Proposal Type. Allowed proposal types for Cycle-5 are **GO, Legacy, GTO, Archive** or **Theory.**
6. For Observing Proposals:
    A. Enter the correct total observing time required.
    B. Make sure you have updated the proprietary period, if necessary. For Legacy proposals it should be 0 days.
    C. Load the AORs that comprise your program. Make sure you have updated the resource estimates for the AORs.
    D. For ToO proposals, check the Target of Opportunity box.
7. For AR and TR proposals make sure you have entered the total funding requested in the proposal cover sheet.
8. Click on the SUBMIT Menu in the Proposal Tool and select 'Submit proposal to SSC.'
9. Prior to the proposal submission deadline, proposals can be modified by using the 'Update Proposal at SSC' option.
10. The proposal PDF file, cover sheet, and any accompanying AORs that reside at the SSC at the time of the proposal submission deadline shall be defined to be the final version of the proposal.

Note that neither NASA nor JPL/Caltech will be responsible for any cost incurred in preparing or submitting a proposal.

7.5.2 Updating Your Submitted Proposal

At any time during the Call for Proposals you may modify any aspect of your submitted proposal, except proposal username and password. You can submit a revised justification, an updated set of AORs, or corrected coversheet information.

1. Start up Spot.
2. Load in new/revised set of AORs if you are updating the AORs.
3. Open the Proposal Tool under the tools menu in Spot.
4. Load in the coversheet file saved from your earlier submission (i.e. filename.cs) by clicking on File-> Open Proposal.
5. Make any desired changes to the coversheet information. Be sure the Hours or Dollars requested is accurate and that the Tool is pointing to the proper justification file (if submitting an updated file).
6. Click on the Submit menu item and then Update proposal at the SSC.
7. Enter your password and email address when requested.
8. If you made any changes to the coversheet information, Spot will again require you to save your coversheet file.
9. Spot will inform you when it has successfully transferred your updated proposal to the SSC. You will also receive an email confirmation.
10. You may submit as may updates as needed prior to the deadline of the Call for Proposals. The software will automatically reject submissions after the deadline and Spot will return an error message.

7.5.3 Modifications to Proposals After the Deadline

Modifications to submitted proposals are not permitted after the deadline. The SSC receives numerous requests to change the spelling of names, update titles, add CoIs to the coversheet, etc. after the proposal deadline. None of these requests will be supported for Cycle-5. Please proof read your proposal before the final submission.

7.6 Proposal Confidentiality

Proposals submitted in response to this Call for Proposals will be kept confidential to the extent allowed by the review process (§8). For approved investigations only, the SSC will make the titles, investigator names, and abstracts publicly available after the selections are announced. The remainder of the approved proposal, and the entirety of proposals not selected, shall remain confidential. In addition, AORs from the approved observing investigations will be incorporated into future versions of the Reserved Observations Catalog and will also be available to download from the Spitzer science operations database using *Spot* and *Leopard*.

If a proposal contains proprietary information that should not be used and /or disclosed for any purpose other than the proposal evaluation, it should be clearly marked by placing the following legend on a separate page that does not count against the proposal page limit:

"NOTICE: The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government and the Jet Propulsion

Laboratory/California Institute of Technology ("Institute") in confidence with the understanding that it will not, without permission of the proposer, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal, the Government or the Institute shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's or Institute's right to use or disclose this information (data) if obtained from another source without restriction."

8 Proposal Evaluation and Selection

Spitzer Space Telescope Cycle-5 research programs will be selected through a competitive peer review process, using the evaluation criteria listed in §8.2.

8.1 Peer Review

Proposals received by the submission deadline will be organized into broad science topics by the SSC Director's Office. *The proposals are assigned to panels based primarily on the science category selected by the Principal Investigator on the proposal coversheet*. The Director's Office will then assign the proposals to Science Review Panels, with members selected from the astronomical community-at-large. In order to minimize institutional, professional and personal conflicts of interest there will be parallel Panels for each broad-based topic, except for the Solar System panel. In Cycle-4 the panels focused primarily in the following areas:

Extragalactic – distant universe and cosmology
Extragalactic – nearby-universe and normal galaxies
Galactic – circumstellar disks, brown dwarfs, extrasolar planets
Galactic – evolved stars, ISM, star-formation, Galactic structure
Solar System – all proposals

The specific distribution of proposals reviewed by each panel in Cycle-5 will depend on the number received in each category. A given set of parallel Panels will review and rank all relevant GO, Legacy, GTO, AR and TR proposals, based on the evaluation criteria listed in §8.2. The evaluations of the Science Review Panels will be forwarded to a Time Allocation Committee (TAC), which will be comprised of a Chair and the Panel Chairs. The TAC will take the results of the Science Review Panels and provide a consolidated list of recommendations to the SSC Director, who will then make the final selection of the Cycle-5 research program.

Proposals will be provided to each panel and TAC reviewer as PDF files on a CD-ROM. It is the responsibility of the proposer to ensure that their PDF file is legible when opened with Acrobat Reader. **Please see http://ssc.spitzer.caltech.edu/documents/makepdf.html for instructions on making legible PDF files.**

8.2 Evaluation Criteria

The Science Review Panels and Time Allocation Committee will base their evaluations of proposals on the criteria listed in this section. The numbered criteria are listed in descending order of importance.

All observing proposals will be evaluated according to these criteria:

(1) The overall scientific merit of the proposed investigation; its potential contribution to the advancement of scientific knowledge; and its potential for enabling new and important types of scientific investigations.

(2) The extent to which the proposed investigation requires the unique capabilities of the Spitzer Space Telescope.

(3) For Legacy General Observer proposals, the utility of the immediately public data and proposed enhanced data products to the broader scientific community. The program should create a legacy for future Spitzer or other NASA investigations.

(4) The long-term archival value of the proposed observations.

(5) The technical feasibility and robustness of the proposed observations and the extent to which the observations can be accommodated within routine Spitzer operations (and the other relevant observatories for joint proposals).

(6) For Joint proposals requesting an award of time on other telescopes, the extent to which the project is fundamentally multi-wavelength in nature and both datasets are required to meet the science goals.

(7) The demonstrated competence and relevant experience of the Principal Investigator and any Co-Investigators as an indication of their ability to carry out the proposed research to a successful conclusion.

Proposals submitted to the Archival Research Program will be evaluated according to these criteria:

(1) The overall scientific merit of the proposed investigation; its potential contribution to the advancement of scientific knowledge; and its potential for enabling new and important types of scientific investigations.

(2) The cost effectiveness and reasonableness for the funding increment requested (§5.2) as it relates to the proposed investigation, including the direct funds being requested and the potential impact on SSC resources for any special needs being requested.

(3) The demonstrated competence and relevant experience of the Principal Investigator and any Co-Investigators as an indication of their ability to carry out the proposed research to a successful conclusion.

Proposals submitted to the Theoretical Research Program will be evaluated according to these criteria:

(1) The overall scientific merit of the proposed investigation; its potential contribution to the advancement of scientific knowledge; and its potential for enabling scientific investigations utilizing Spitzer, enhancing their interpretation (in the context of new models or theories), and/or by refining the knowledge needed to interpret specific Spitzer results.

(2) The cost effectiveness and reasonableness for the funding increment requested (§5.2) as it relates to the proposed investigation, including the direct funds being requested and the potential impact on SSC resources for any special needs being requested.

(3) The demonstrated competence and relevant experience of the Principal Investigator and any Co-Investigators as an indication of their ability to carry out the proposed research to a successful conclusion.

(4) Plans for timely dissemination of the theoretical results, and possibly models, software or tools, to the astronomical community.

8.3 Proposal Selection

The Spitzer Science Review Panels and Time Allocation Committee are currently scheduled to conduct their peer reviews on February 11-15, 2008. The SSC Director, the NASA-designated selection official, plans to announce the final selections before the end of March 2008 with Cycle-5 observations beginning in July 2008.

9 Contacting the Spitzer Science Center (SSC)

The SSC postal mailing address is:

Spitzer Science Center
California Institute of Technology
Mail Code 314-6
1200 East California Boulevard
Pasadena, CA 91125 USA

The SSC central telephone lines are:

Phone: +1-626-395-8000 Fax: +1-626-432-7484

The science community should consult the Spitzer Science Center Website at:

http://ssc.spitzer.caltech.edu/.

Questions about any aspect of the Spitzer Space Telescope, including the Call for Proposals, may be submitted electronically to the Helpdesk at:

help@spitzer.caltech.edu.

10 Publication and Dissemination of Science Results

The publication and dissemination of science results is critical in assessing the success of the Spitzer Space Telescope mission, and in assessing how effectively it meets the goals of NASA's strategic plans in space science. The Spitzer research community is reminded of the important responsibility inherent in utilizing this national resource, and in sharing the scientific results with the general public. In particular, investigators with potentially important and newsworthy results should contact the SSC as early as possible to help NASA plan appropriate news releases.

10.1 Science Publications

It is expected that useful scientific results obtained through Spitzer observations, archival research, and theory investigations will be published in the scientific literature. All publications based on Spitzer data or theory investigations 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 telescope, including the relevant science instruments. These references are posted on the SSC website (http://ssc.spitzer.caltech.edu/pubs/seminalobs.html). Moreover, the SSC advises investigators to accurately trace the original heritage of any Spitzer archival data. In particular, scientific results based on data from the Legacy Science Program should cite appropriate references to the appropriate program (http://ssc.spitzer.caltech.edu/legacy/all.html).

10.2 Press Releases

Researchers who receive Spitzer Space Telescope observing time and/or NASA funding support are strongly encouraged to release Spitzer-related and newsworthy information through NASA channels. This does not preclude news releases by other institutions, although such parallel releases must be coordinated with NASA. The SSC utilizes the public affairs resources of NASA and the Jet Propulsion Laboratory to maximize the impact of discoveries and newsworthy items resulting from Spitzer research investigations. NASA has "first right of refusal" for such items and has a policy to distribute all information and news fairly and equitably. This policy also means that exclusive news releases are not supportable.

Scientists with potentially newsworthy observations should contact the SSC Director's Office via the Helpdesk (*help@spitzer.caltech.edu*). *Spitzer investigators should initiate such contact well before the expected publication of those results,* in order to allow the SSC, JPL, and NASA to prepare press releases and supporting materials. The contact may either be initiated by the Principal Investigator of the Spitzer investigation, or through the public affairs office of their home institution. For a potential press release, the SSC and NASA will coordinate with the PI and/or institutional public affairs office in the preparation of a draft news release and other supporting materials. In general, the press release date will be timed to coincide with acceptance of the research for publication in a science journal, or presentation at a major astronomical meeting.

For additional information on Spitzer public affairs, including guidelines on what may constitute a newsworthy result, consult the 'Got News' link on the SSC website (http://ssc.spitzer.caltech.edu/approvdprog/newsworthy.html).

11 Education and Public Outreach Programs

No additional funding will be available for Cycle-related EPO programs for successful Cycle-5 proposers. Investigators interested in pursuing EPO should contact the EPO professionals at the Spitzer Science Center via the Helpdesk.

12 Guide for Observing Proposals

1. Read a summary of the capabilities of the Spitzer Space Telescope (§3).
2. Download the *Spitzer Space Telescope Observer's Manual* from the Proposal Kit section of the SSC website (http://ssc.spitzer.caltech.edu/propkit) to obtain additional details about the telescope, science instruments, and the eight observing modes available for Cycle-5.
3. Download and install the S16 version of *Spot*, the Spitzer proposal planning and submission software package, available in the online Proposal Kit, to your host machine. It is now available. Allow *Spot* to auto-update to the latest version.
4. Download and read the *Spot User's Guide* and learn how to create and edit an Astronomical Observation Request (AOR), the fundamental unit of Spitzer observing.
5. Download and read the *Spitzer Space Telescope Observation Planning Cookbook*, also in the Proposal Kit, to see examples of typical observations.
6. Use *Spot* to create, edit and store sequences of AORs to construct a Spitzer observing program.
7. Determine whether to submit a small, medium or large proposal (§5.1.2). If requesting 50 or more hours of observing time, decide whether to submit a regular GO or Legacy proposal (§5.1.2.1).
8. Be sure that your proposed observations do not duplicate (§6.5.1) existing Spitzer Space Telescope observations by consulting the *Reserved Observations Catalog* or searching the Spitzer Science Archive with *Leopard*. If duplicate observations are proposed be sure you have provided a strong scientific justification.
9. Contact the electronic Spitzer Helpdesk (*help@spitzer.caltech.edu*) for assistance, if needed.
10. Prepare your observing proposal according to the guidelines listed in §§7.1-7.3. Templates for preparing the PDF proposal attachment in Latex and Microsoft Word formats are available in the online Proposal Kit. Proposals submitted that don't utilize the Cycle-5 templates will be rejected outright.
11. Note the evaluation criteria listed in §8.2.
12. Note that NASA data analysis support for eligible investigators (§4.2) will be determined through formulaic means (§5.1.11) and that no cost plan is necessary. If you are expecting funding you will be contacted *after* the proposal is approved to provide data funding distribution and financial contact information.
13. Follow the steps described in §7.5 to electronically submit your proposal, cover sheet, and accompanying AORs to the SSC prior to the deadline of Friday, November 16, 2007 5:00 pm PST.
14. If you experience computer or Internet problems just prior to the deadline such that you are not able to submit your proposal by 5:00 pm, do not wait for 3 or 4 hours to contact us. Call us at 626 395-8000 (SSC central phone line) and let us know.

13 Guide for Archival/Theoretical Researchers

1. If no funding support is required, no Archival Research (AR) or Theoretical Research (TR) proposal is necessary. AR proposals may be submitted for analysis of all Spitzer data that will be publicly available by December 31, 2008.
2. Download the *Spitzer Space Telescope Observer's Manual* from the Proposal Kit section of the SSC website (http://ssc.spitzer.caltech.edu/) to obtain additional details about the telescope, science instruments and how Spitzer data are collected, processed and analyzed.
3. AR and TR proposers may also find the various links from the SSC Data Archives/Analysis page (http://ssc.spitzer.caltech.edu/archanaly) to be useful.
4. Download and install the S16 version of *Spot*, the Spitzer proposal planning and submission software package, available in the online Proposal Kit, to your host machine. It is now available. *Spot* includes the proposal submission tool for AR/TR investigators.
5. Download the *Spot User's Guide* and read the relevant proposal submission chapter to understand how to create and submit an AR/TR proposal.
6. Contact the electronic Spitzer Helpdesk (help@spitzer.caltech.edu) for assistance, if needed.
7. Prepare your AR/TR proposal according to the guidelines listed in §§7.1, 7.2, and 7.4. Templates for preparing the PDF proposal attachment in Latex and Microsoft Word formats are available in the online Proposal Kit. Proposals submitted that don't' utilize the Cycle-5 templates will be rejected outright.
8. Note the evaluation criteria listed in §8.2.
9. Follow the steps described in §7.5 to electronically submit your proposal and cover sheet to the SSC prior to the proposal deadline of November 16, 2007 5:00 pm PST. *No detailed or institutionally endorsed budget is required.*
10. If you experience computer or Internet problems just prior to the deadline such that you are not able to submit your proposal by 5:00 pm, do not wait for 3 or 4 hours to contact us. Call us at 626 395-8000 (SSC central phone line) and let us know.

14 Appendix A: Spitzer Space Telescope Observing Rules

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

14.1 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 (§14.5.1). 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.

14.2 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.

14.2.1 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 (§14.14) of the original observer end.

14.2.2 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 (§14.3.2). 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 §14.2.1 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 §14.2.1 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.

14.3 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).

14.3.1 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.

14.3.2 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.*

14.4 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.

14.4.1 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 (§14.12) 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.

14.4.2 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.

14.5 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.

14.5.1 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 (§14.5.2) 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 (§14.1), 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.

14.5.2 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.

14.5.3 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.*

14.6 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 §14.5.]

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.

14.6.1 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 §14.2) 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 §14.6.2 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.

14.6.2 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 (§14.5).

14.7 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 §14.6). 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.

14.8 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

14.9 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 (§14.2).

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 §14.10), it is the responsibility of the requesting investigator to include those special calibration observations as part of their proposed observational program.

14.10 Special Calibrations

Any additional calibration(s) that are not included as part of routine calibrations (§14.9) 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.

14.11 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.

14.12 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).

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.

14.13 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.

14.14 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.

14.15 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.

15 Appendix B: Spitzer Space Telescope Science Schedule

The monthly calendar of Spitzer events pertaining to the science user community is available at the SSC website (http://ssc.spitzer.caltech.edu/geninfo/sched/). Major events include:

August 2007	Cycle-5 Call for Proposals Issued
November 2007	Cycle-5 proposals due
December 2007	Spitzer Science Conference – Evolving ISM in the Milky Way & Nearby Galaxies
February 2008	Cycle-5 proposal review
March 2008	Cycle-5 proposal results announced
July 2009	Cycle-5 begins
March 2009	Predicted end of cryogenic mission

15.1 Spitzer Warm Mission

The Spitzer project has proposed a "warm" mission (IRAC 3.5 and 4.6 micron channels only) that will last up to 5 years from the end of cryogenic operations. We expect to present specific plans to a NASA Senior Review in spring 2008. Phasing of Warm Mission Calls for Proposals will likely be finalized after this review. Potential science opportunities for the warm mission were discussed at a workshop in June 2007 and the workshop white papers and presentations are available at http://ssc.spitzer.caltech.edu/mtgs/warm. While we expect to emphasize very large programs in the warm mission we do plan to retain the capability to support small programs. Approved observations that remain unexecuted at the end of the cryogenic mission will not be carried forward into a warm mission.

16 Appendix C: Legacy Science Program

The Spitzer Space Telescope Legacy Science Program was motivated by a desire to enable major science observing projects early in the mission, with the goal of creating a substantial and coherent database of archived observations that can be utilized by subsequent Spitzer researchers, including General Observers (GOs). The proposal category proved popular, for although Legacy programs were not specifically solicited in Cycle-2, five programs were selected that met the Legacy selection criteria. In Cycle-3 Legacy proposals were once again available and eight were selected. Seven Legacy proposals were selected in Cycle-4.

Legacy projects are distinguished from GO investigations by the following fundamental principles:

- They are *large and coherent science projects*, not reproducible by any reasonable number or combination of smaller GO investigations;

- They are projects of *general and lasting importance* to the broad astronomical community, with the Spitzer observational data yielding a *substantial and coherent database*; and

- They are projects whose raw and pipeline-processed *data enter the public domain immediately upon SSC processing and validation*, thereby enabling timely and effective opportunities for follow-on observations and for archival research, with both Spitzer and other observatories.

Full details on all the approved Legacy Programs are available online at http://ssc.spitzer.caltech.edu/legacy.

17 Appendix D: Director's Discretionary Time

The SSC Director as Director's Discretionary Time (DDT) allocates Five percent of the available Spitzer Space Telescope observing time. It is intended to facilitate observations that address emerging scientific topics or areas missed in the proposal review process. Investigators wishing to request DDT can do so at any time during the year, by using the DDT submission form and procedures described on the SSC website (http://ssc.spitzer.caltech.edu/geninfo/ddt).

The primary utilization of DDT will be in support of community-proposed requests that are based on exceptional, time-critical observing opportunities that cannot be accommodated with the regular cycle. Other DDT usages may include innovative observations that extend the scientific capabilities of Spitzer, and extraordinary events and opportunities that necessitate -- in the view of the SSC Director -- observations to be obtained with Spitzer for the benefit of the astronomical community. Requests for DDT must be submitted electronically to the SSC Director via the online form on the SSC website (http://ssc.spitzer.caltech.edu/geninfo/ddt). All questions should be sent to the Helpdesk (help@spitzer.caltech.edu).

The DDT requests must include a strong scientific justification, completed Astronomical Observation Requests (if possible) and must specify why the request could not be submitted via a proposal to the regular GO program. A proposal for DDT might be appropriate in cases where a truly unexpected transient phenomenon occurs or when developments since the previous Spitzer proposal deadline make a time-critical observation necessary. *Requests for DDT cannot be used to resubmit all or part of a proposal that was rejected by the normal peer review process.*

Recognizing the limited lifetimes for major space astronomy facilities such as the Hubble Space Telescope, the Chandra X-ray Observatory and the Spitzer Space Telescope, DDT proposals for rapid follow-up of new discoveries will also be considered. In such cases, the proposing investigator must demonstrate that the observations will provide a critical link in the understanding of the phenomena and that carrying them out quickly is particularly important for planning future observations with major facilities. They should then also indicate their plans for quickly making the scientific community aware of their discoveries, to enable subsequent wider community follow-up.

A request for DDT observations is predicated on the assumption that the proposed observations are deemed to be urgent and will be of interest to the broad scientific community. Therefore, proprietary data periods for DDT observations will be no more than three months, at which point the data will enter the public domain. 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.

18 Appendix E: Special Telescope Overheads

Special overhead burdens are applied to:

1. observations of high- and medium-impact Targets of Opportunity (ToO),
2. rapid non-sequential instrument observations of a target, and
3. solar system targets with a late ephemeris change.

These special overheads are added to the normal overheads applied to each Astronomical Observation Request (AOR) computed by *Spot*, the software required for Spitzer observation planning and proposal submission. They represent current estimates of the time required to prepare for the observation and to return the Telescope to its nominal configuration and schedule. As described in §14.1 of the *Spitzer Space Telescope Observing Rules* (Appendix A), the special overheads are intended to reflect the observing time lost in other programs as a result of executing the relevant observation(s).

For observations in categories (1) and (2) above, it is deemed that access to the source in a timely manner is more important than the calibration accuracy. The advantages of stable operations within a normal instrument campaign of 7-21 days are compromised in these quick-turnaround scenarios, and the Principal Investigator needs to ensure that the data collection is sufficiently robust to meet reliability and calibration accuracy requirements.

In evaluating General Observer proposals, peer reviewers will assess the value of observations with special overhead burdens against other proposed observations. Proposals *must* include these overheads in the total requested observation time. The special telescope overheads are listed below.

High-Impact Target of Opportunity, Single Instrument: 6.5 hours
This overhead will be applied to the first AOR in a *group*, *chain* or *sequence* of AORs to be executed consecutively during a single observing session on a single ToO with one science instrument. For observations that are constrained with a *follow-on* constraint, the overhead must be applied to every AOR individually. The *group*, *chain* or *sequence* constraints mean observations can be scheduled contiguously and therefore have less impact on the schedule than those constrained with a *follow-on* constraint.

High-Impact Target of Opportunity, Multiple Instruments: 8.8 hours
This overhead will be applied to the first AOR in a *group* of AORs to be executed consecutively during a single observing session on a single ToO. Either two or three instruments may be used if the observation is constrained in a manner that allows the instruments to be used in any order. For observations that are constrained with a *follow-on* constraint, the overhead must be applied to every AOR individually.

Medium-Impact Target of Opportunity, Single Instrument: 2.6 hours
This overhead will be applied to the first AOR in a *group, chain or sequence* of AORs to be executed consecutively during a single observing session on a single ToO with one science

instrument. For observations that are constrained with a *follow-on* constraint, the overhead must be applied to every AOR individually.

Medium-Impact Target of Opportunity, Multiple Instruments: 5.2 hours
This overhead will be applied to the first AOR in a *group* of AORs to be executed consecutively during a single observing session on a single ToO. Either two or three instruments may be used if the observation is constrained in a manner that allows the instruments to be used in any order. For observations that are constrained with a *follow-on* constraint, the overhead must be applied to every AOR individually.

Non-Standard Sequential Observations: 2.6 hours per instrument change
The normal cycle of scheduled instrument campaigns (of 7-21 days duration) will be IRAC-MIPS- IRS-IRAC, etc. Requests for observations, to be executed in rapid succession, that violate this sequence will be assessed additional overheads per instrument change. For example, a request for IRAC observations, followed shortly thereafter by IRS observations, will be assessed an additional 2.6 hours of overheads. A request for near-contemporaneous observations of a target with all three instruments will be assessed 5.2 hours of special overheads.

Late Ephemeris Update: 0.5 hour
This overhead will be applied to the first AOR in a *group, chain or sequence* of AORs to be executed consecutively on the same moving target during a single observing session, using a single science instrument. Use of multiple instruments will incur yet additional special overheads, as described above. Late ephemeris updates are required if an ephemeris update is required less than 5 weeks prior to the start of the week in which the observation will execute. The ephemeris will be updated two weeks prior to the start of the week in which the observation is scheduled. Anyone requesting an ephemeris update later than this time should strongly justify it in his or her proposal.

These overheads must be specified using *Spot* when the AORs for the proposal are created. From within the relevant AOR dialog click the **Special …** button and select the appropriate overheads from the list. *Spot* will calculate the required time and add it to the Total Duration returned on the main *Spot* AOR page.

19 Appendix F: Allowable Costs

Detailed budgets are no longer required to be submitted with AR/TR proposals. If you are at an institution that requires a detailed budget prior to the issuance of your funding contract then the guidelines provided below for allowable costs will apply.

19.1 Salaries and Wages

Direct labor costs for eligible project investigators should be included and itemized. Spitzer Space Telescope funds may not be used to pay more than a person's full-time salary or to pay more than an individual's hourly wage rate. An investigator may not normally be reimbursed for consulting or other work in addition to a regular full-time institutional salary covering the same period of employment. For faculty members in academic institutions, Spitzer funding will normally be limited to no more than two months of summer salary support. Exceptions for released time during the academic year (e.g., "buying back" teaching time) may be permitted, but such costs must be fully justified in the proposal and the compensation requested must be reasonable and consistent with each employee's regular full-time salary or rate of compensation. Released time for project investigators working in non-academic institutions may be proposed, provided the compensation requested is reasonable and consistent with each employee's regular full-time salary or rate of compensation.

It is assumed that most scientists will be affiliated with institutions that will make substantial support available for project activities (e.g., computer facilities, collaboration with other scientists, students, or research assistants).

19.2 Research Assistance

Direct labor costs for graduate students, post-doctoral associates, data aides, and secretarial and technical support should be included and itemized. For post-doctoral associates and other professionals, each position should be listed with the number of months, percentage of time that will be spent on the project, and rate of pay (hourly, monthly, or annual). For graduate students and secretarial, clerical and technical staff, only the total number of persons and the total amount of salaries per year in each category are required. All such salaries must be in accordance with the standard policies of the institution assuming responsibility for the project.

19.3 Fringe Benefits

If an institution's usual accounting practices provide that its contributions to employee "benefits" (Social Security, retirement, etc.) be treated as direct costs, funds may be requested for all applicable fringe benefits. In this case, proposers must break out the associated costs and list them as a separate cost component within the direct labor element.

19.4 Publication Costs

Reasonable costs for publication of research results obtained from a Spitzer research investigation should be included as a component of "Other Direct Costs."

19.5 Travel

Itemized transportation and subsistence costs for project personnel to plan, obtain, analyze, and disseminate direct results of a Spitzer research investigation should be included. Proposers must include origin/destination, number of travelers, number of trips, and costs associated with each, and include this information as a component of "Other Direct Costs." Support for obtaining ground-based observations necessary for the interpretation of Spitzer data is a reasonable component of an AR proposal.

19.6 Computer Services

The itemized costs of computer time and software for the analysis of Spitzer data should be included. Details of the services and software that will be used must be fully described and justified in the proposal, and included as a component of "Other Direct Costs."

19.7 Equipment

Itemized equipment costs, including computers or related hardware, should be included and accompanied by a detailed justification in the budget narrative. In general, the title to approved equipment purchased for $5,000 or less will be vested with the Contractor (i.e. the investigator's institution). The title to equipment costing in excess of $5,000 will be vested with the U.S. Government, unless JPL and/or NASA indicate otherwise in writing. In either case, if the proposer seeks title to the equipment, it must be noted in their budget narrative.

19.8 Materials and Supplies

The itemized costs of materials and supplies directly related to the Spitzer research investigation may be included, provided such costs are not already reimbursed through indirect costs or some other means. These costs should be included as a component of "Other Direct Costs."

19.9 Indirect Costs (IDCs)

Indirect costs may be proposed, provided that the IDC rate used in the budget is based on a Negotiation Agreement with the Federal Government, or its designated agent.

20 Appendix G: Acronyms and Abbreviations

2MASS	Two-Micron All-Sky Survey
AAS	American Astronomical Society
AOR	Astronomical Observation Request(s)
AOT	Astronomical Observation Template(s)
AR	Archival Research
BIC	Baseline Instrument Campaign schedule
Co-I	Co-Investigator
CP	Call for Proposals
CREI	Cost Reimbursement with an Educational Institution
CXC	Chandra X-Ray Center
CXO	Chandra X-Ray Observatory
DDT	Director's Discretionary Time
DSS	Digital Sky Survey
EPO	Education and Public Outreach
FAQ	Frequently Asked Questions(s)
FOV	Field of View
GO	General Observer(s)
GTO	Guaranteed Time Observer(s)
HST	Hubble Space Telescope
IBC	Impurity-Band Conductor(s)
IDC	Indirect Cost(s)
IER	Instrument Engineering Request(s)
IOC	In-Orbit Checkout
IPAC	Infrared Processing & Analysis Center
IRAC	InfraRed Array Camera
IRS	InfraRed Spectrograph
IRSA	InfraRed Science Archive
ISO	Infrared Space Observatory
JPL	Jet Propulsion Laboratory
MIPS	Multiband Imaging Photometer for Spitzer
NAIF	Navigation and Ancillary Information Facility
NASA	National Aeronautics and Space Administration
NED	NASA/IPAC Extragalactic Database
NOAO	National Optical Astronomy Observatory
NRAO	National Radio Astronomy Observatory
OSS	Office of Space Science
PDF	Portable Document Format
PI	Principal Investigator
ROC	Reserved Observations Catalog
RSA	Research Support Agreement
SA	Science Archive
SED	Spectral Energy Distribution(s)
SIMBAD	Set of Identifications, Measurements and Bibliography for Astronomical Data

SLO	Second-Look Observation(s)
SODB	Science Operations Database
STScI	Space Telescope Science Institute
SOM	Spitzer Observer's Manual
SSC	Spitzer Science Center
TAC	Time Allocation Committee
ToO	Target(s) of Opportunity
TR	Theoretical Research