SIRTF SURVEYS AND LEGACY SCIENCE

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1. Introduction

The Space Infrared Telescope Facility (SIRTF), a 0.85-meter, cryogenically-cooled telescope, will be launched in 2002. SIRTF will extensively make use of large-format detector arrays. These, combined with the sky visibility of SIRTF's solar orbit will facilitate significant surveys. SIRTF surveys will complement observations by NASA's other Great Observatories and will enable follow-up SIRTF studies. Data from the large, "SIRTF Legacy Science Program" will be made widely available, on a rapid, non-proprietary release, to the general astronomical community.

2. SIRTF: Instruments and Survey Capabilities

SIRTF is a $f/12$ Ritchey-Chretien Cassegrain system, with instruments located behind the primary mirror. The three instruments sharing the $26'$ FOV are the Infrared Array Camera (IRAC: four bands 3.5–8.0 μm), the Multiple Infrared Photometer for SIRTF (MIPS: four bands 30–160 μm), and the Infrared Spectrometer (IRS: 5–40 μm, with two resolutions). Many of the attributes of the SIRTF system are conducive to large surveys.

SIRTF will be exceptionally sensitive. The large array detectors in each of the three SIRTF instruments yield a tremendous multiplex advantage for both imaging and spectroscopy.

SIRTF will last at least 30 months, which will permit major surveys and/or Legacy Science Projects early in the mission, and will encourage the use of results from these initial surveys and projects to guide follow-up observations duing the remainder of the mission.

The SIRTF orbit is ideal for surveys or deep staring projects, allowing unconstrained access to 30% of the sky at any one time, with at least 35 days of consecutive viewing of any given region.

B.J. McLean et al. (eds.), New Horizons from Multi-Wavelength Sky Surveys, 109–111.

SIRTF instruments have exceptionally high throughput, due to: wavelength multiplexing, wherein dichroic beamsplitters feed dual detector arrays; and angular multiplexing, wherein instruments each simultaneously view multiple portions of the sky.

These major SIRTF capabilities, taken *together*, will enable highly efficient, sensitive, and comprehensive fast, deep, and targeted surveys (both spatial and spectral) to be uniquely performed (Werner 1993). A fast area survey could be used to search for brown dwarfs or the stellar content of molecular cloud complexes. Deep surveys could be employed to test luminosity evolution of ultra-luminous galaxies and to search for L_* galaxies at $Z > 3$. Targeted surveys could be used to study planetary debris disks.

3. The Community Legacy Science Program for SIRTF

SIRTF will possess the requisite unique capabilities to perform large (or "Key") investigations, which are expected to have profound impact on several areas of astrophysics. The *SIRTF Legacy Science Program* will be characterized by larger scope, broad community interest, vital immediate *and* lasting importance, and rapid, non-proprietary release of data. SIRTF Legacy Science Projects have some basic characteristics which together make them *qualitatively* different from other SIRTF programs:

The scientific goals of a Legacy Project will be of paramount importance and cannot be easily duplicated by one or more smaller projects.

The data products resulting from a Legacy Project will be of **lasting importance** to a wide community and will support extensive archival research. The data products resulting from a Legacy Project will be of **immediate importance** to other SIRTF projects, while the observatory is still in operation, and will enable effective follow-up observations using SIRTF, *HST*, *AXAF* and other facilities.

Legacy Projects may be large, and might need up to thousands of hours of SIRTF time. A first approximation to the time available for Legacy observations is about 25–30% of the spacecraft time, or 400–6000 hours (about 2× WIRE). This amount of time might translate into three or four 1500–2000 hour-class Legacy projects. Because of the broad range of needs these Legacy Projects will serve, and to facilitate follow-on SIRTF investigations, most Legacy projects should be undertaken early in the SIRTF mission.

The community will play a key role in shaping the nature and scientific balance in the Legacy Program for SIRTF, via concept airing workshops, setting science priorities, proposal competition and a mentoring program. Legacy Projects will be developed and publicized by community teams and competed in the selection process.

More Information: There is a World Wide Web home page with descriptions of the rationale for the mission, important scientific themes of the mission, and the three science instruments (IRS, MIPS, and IRAC) at `http://sirtf.jpl.nasa.gov/sirtf/home.html`.

References

Werner, M. W. 1993, in Sky Surveys: Protostars to Protogalaxies, ed. B. T. Soifer, Astron. Soc. Pacific Conference Series 43, 249.