NASA Infrared Telescope Facility
University of Hawaii,
Institute for Astronomy

Honolulu, Hawaii 96822

This report covers the period from 1 July 2001 through 30 June 2002. The NASA Infrared Telescope Facility (IRTF) is a 3.0 m infrared telescope located at an altitude of 4.2 km on the summit of Mauna Kea in Hawaii. It was established by NASA in 1979 primarily to provide infrared observations in support of NASA's programs. The IRTF is managed and operated by the University of Hawaii (UH) Institute for Astronomy (IfA) under a five-year cooperative agreement between NASA and UH that started in February 2001. NASA provides the costs of operation, and NSF provides support for new focal plane instrumentation based on grant applications from IRTF support astronomers. Observing time is open to the entire astronomical community, and 50% of the IRTF observing time is reserved for studies of solar system objects.

1. PERSONNEL

Alan Tokunaga was the IRTF division chief during the period. Support astronomers were John Rayner (deputy division chief) and Shelte (Bobby) Bus. Rolf Kudritzki was PI of the IRTF cooperative agreement with NASA. George Koenig was superintendent of the telescope day crew, and Lars Bergknut became foreman in October 2001. Other members of the day crew were Imai Namahoe, Sammy Pung, and Danley Lee. Telescope operators were Bill Golisch, Dave Griep, and Paul Sears. Engineering/technical staff included Peter Onaka (senior electronics engineer), Doug Toomey (instrumentation engineer), Greg Ching (electronics technician), Darryl Watanabe (instrument technician), Dan O'Connor (engineering physicist), Tony Denault (senior software engineer), Charles Lockhart (embedded software engineer), Miranda Hawarden-Ogata (network engineer), and Tim Bond (senior mechanical engineer). Karan Hughes was the secretary/project assistant, Susan Lemn was the clerk-typist until May 2002, and Chris Kaukali and Sandra Miyata were the IRTF fiscal officers. The total IRTF staff numbered 24 full-time equivalents.

2. COMMITTEES

The NASA Management and Operations Working Group (MOWG) for the IRTF was chaired this year by Robert Millis (Lowell Obs.). This advisory group to NASA provides oversight of IRTF operations. Other members were Jacques Beckers (National Solar Obs.), William Cochran (McDonald Obs., Univ. of Texas), Heidi Hammel (Space Sci. Inst.), Ken Johnston (U.S. Naval Obs.), Peter Schloerb (Univ. of Massachusetts), and Neville Woolf (Univ. of Arizona). Theodore Kostiuk (NASA GSFC), David Mozurkewich (NRL), and David Koerner (Univ. of Pennsylvania) replaced Yervant Terzian (Cornell Univ.), Jim Elliot (MIT), and Ken Johnston (U.S. Naval Obs.) as of February 2002. Ex-officio members were Vernon Pankonin (NSF), Tom Morgan (NASA), and J. Hillman (NASA).

Timothy Brooke (JPL), William Cochran (McDonald Obs., Univ. of Texas), James Graham (UC Berkeley), Kevin Luhman (CfA), David Osip (MIT), Michal Simon (SUNY Stony Brook), David Turnshek (Univ. of Pittsburgh), and Faith Vilas (NASA JSC) served on the IRTF Time Allocation Committee. The TAC is chaired by IRTF Division Chief Alan Tokunaga, but he does not vote on proposals.

3. USAGE OF THE IRTF

Deadlines for observing proposals are 1 October for February–July and 1 April for August–January. The IRTF received 116 applications for observing time for the second semester of 2001. Eighty-eight applications were received for observing time for the first semester of 2002. The average oversubscription factor was 2.0 for solar system programs and 3.0 for non–solar system programs. The scheduled programs involve over 200 U.S. and foreign astronomers each semester. About 26% of the scheduled observing time was lost to bad weather and 1.2% to IRTF instrumentation and other facility problems.

4. THE TELESCOPE

The IRTF has an f/38 Cassegrain focus with two secondary mirror structures, one for tip-tilt and one for chopping. The Cassegrain instruments are mounted on the Multiple Instrument Mount, which allows for the simultaneous mounting of up to four instruments. Under normal circumstances, the IRTF facility instruments are kept mounted and ready for continuous use. Instrument changes can be accommodated in less than 30 minutes. This allows for short programs that require only a partial night.

4.1 Facility Instruments

The present complement of IRTF instruments covers the 1–25 μm spectral range.

SpeX is a 0.8–5.4 μm spectrograph with low to moderate resolving power (100–2500). It was commissioned in August 2000. The spectrograph section uses a 1024×1024 InSb array with 0.″15/pixel. Five spectroscopic modes are supported. Slit widths from 0.″3 to 0.″3 are available. There is a slit viewer that can also provide infrared guiding and imaging capability. It has a 512×512 InSb array with 0.″12/pixel, 60″×60″ field of view, and a 15-position filter wheel.

NSFCAM is a 1–5 μm camera with a 256×256 InSb array. It has three selectable image scales of 0.″06, 0.″15, and 0.″30/pixel, and 24 filters. A unique feature of NSFCAM is that it has circular variable filters (CVFs) that provide 1–2% spectral resolution from 1 to 5 μm. NSFCAM also features a grism for long-slit spectroscopy. A warm waveplate rotator assembly allows linear polarization measurements to be obtained.

CSHELL is a high-resolution spectrograph that covers the 1–5.5 μm spectral range with 0.″20 pixels. CSHELL uses a 256 x 256 InSb array. It has a 30″ long slit and can also image a 30″×30″ area for easy object acquisition. Slits from

0.″5 to 4.″0 wide can be selected, and the 0.″5 slit provides a spectral resolution R = 43,000. An internal science-grade CCD is used for guiding.

MIRLIN is a 10–20 μm camera that is available as a facility instrument for up to four months per semester by arrangement with its developer, Mike Ressler (JPL). The camera utilizes a 128×128 Si:As BIB array. The pixel scale is 0.″46/pixel. The user interface is similar to that of NSFCAM, CSHELL, and SpeX.

4.2 Visitor Instruments

The IRTF supports a number of visitor instruments and has encouraged the collaborative use of these instruments by advertising them on its Web site and in the semiannual announcement of observing time. A brief description of these instruments is given here:

TEXES is a high-resolution spectrograph for 8–25 μm. J. Lacy and M. Richter (Univ. of Texas) are the PIs on this instrument. It provides a resolving power of up to 100,000.

BASS is a low-resolution spectrograph that can cover the entire 3–13.5 μm spectral range in a single exposure with R = 25–120. It employs two 58-element BIB arrays. D. Lynch (Aerospace Corp.) is the PI.

CELESTE is a high-resolution 5–25 μm spectrograph that provides a resolving power of about 10,000. D. Jennings (GSFC) is the PI.

4.3 Facilities

In August 2000, the IRTF staff moved into the new IfA-Hilo building, which is located in the University of Hawaii at Hilo Research Park. New laboratory spaces, a new machine shop, remote observing facilities, and new laboratory equipment are available for IRTF operations. About two-thirds of the staff are located in Hilo, and the remainder are located in Honolulu. Instrumentation efforts are conducted both in Hilo and Honolulu.

4.4 New Instruments

A new adaptive optics (AO) system was installed in May 2002. This is a 36-element curvature-sensing AO system that is similar to the University of Hawaii Hōkūpa‘a AO system. Engineering tests will continue for six months, and the AO system will be opened for shared-risk use starting in February 2003.

Since the AO system is installed above the instrument light path, the instrument spool and the acquisition guider have been also replaced. The acquisition guider has a second visible CCD channel that allows for visible photometry. The main objective of this CCD camera is to provide nearly simultaneous visible and thermal infrared photometry of asteroids.

4.5 Image Quality

To enhance image quality, a defective dome chiller was replaced, and improvements to the dome air conditioning system were made. Installation of hardware to remove heat from the focal plane electronics was scheduled for completion in November 2002. Future projects will include improvement of the dome sealing and cooling of the primary mirror.

4.6 Remote Observing

The IRTF has started to implement remote observing over the Internet. There have been several remote observing runs using NSFCAM and SpeX. The observer controls the instrument from his or her office on the mainland with assistance from the telescope operator. Based on the success of these experiments, remote observing from both the IRTF Hilo office and from the observer’s home office began in August 2002.

5. BUDGET

For the period 1 February 2002 to 31 January 2003, the IRTF has an operating budget of $3.2 million, which includes support for the equivalent of 24 full-time positions, including the personnel devoted to fabrication and maintenance of instruments. Additional funds are secured from the NSF for instrument development. An NSF grant to upgrade NSFCAM with a 2048 × 2048 array has been awarded to the IRTF. As part of this upgrade, a single 40 milliarcsec per pixel scale will be provided, and a second wave-front sensor for use on extended objects will be fabricated. A NASA grant to replace the obsolete telescope control system will fund a 24-month project to begin at about the end of 2002.

6. WEB-BASED INFORMATION ACCESS

The IRTF Web site (http://irtfweb.ifa.hawaii.edu/) provides convenient access to IRTF information. Available information includes observing time application forms, instrument and telescope manuals, photometric catalogs, and the telescope schedule.

Alan Tokunaga