NEWFIRM Achieves First Light!

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The NOAO Extremely Wide-Field Infrared Imager (NEWFIRM) saw first light on the KPNO Mayall 4-meter telescope on 2 February 2007. After several days of delay due to a winter storm front, the scheduled first commissioning run concluded with four successful nights of testing and observing.

NEWFIRM is NOAO’s newest instrument, providing both broadband and narrowband imaging capabilities over a square field of view 28 arcmins on a side, at a resolution of 0.4 arcsecs/pixel. It covers the wavelength range of 1.0 – 2.5 microns. The initial filter complement includes standard J, H and K-short (2.0-2.3 microns) as well as 1.3% narrow-band filters centered on Brackett-γ (2.16 microns), H2 (2.12 microns) and [Fe II] (1.64 microns), all at zero redshift.

Observing targets on the first four nights included standard star and blank-sky flat fields to characterize image quality, throughput, and background sky levels, as well as astrometric fields to determine distortion across the field of view. Tests were also carried out for scattered light and “ghost” images, and for the effects of grazing illumination by very bright sources. In addition to this important work of characterizing the instrument, about half of each night was devoted to narrowband...
imaging of the Orion Nebula (M42) as part of the science verification program (see www.noao.edu/ets/newfirm/sv.htm). John Bally (University of Colorado) and Josh Walawender (University of Hawaii/IfA) carried out these observations as part of the science verification team.

The success of this run confirms that NEWFIRM will be made available for Principal Investigator (PI) science proposals in semester 2007B on a shared-risk basis. Also, the “back end” software, including the quicklook observer tools and the data reduction pipeline, may not be in their final state by the beginning of 2007B. Some or all of the data processing tools may not be available, which is why the availability is considered “shared-risk.” Please note that this availability extends to short-term PI proposals only—no survey program proposals for NEWFIRM will be accepted in this first semester.

Information about the instrument will be posted as soon as possible under a prominent banner heading on the NEWFIRM Web page at www.noao.edu/ets/newfirm. Posting will be done in time to provide the information needed to support proposal writing. Please check this Web page often for updates about NEWFIRM.

The remaining commissioning and science verification runs are scheduled for April and June 2007. Much remains to be done in the interim, including replacement of the field flattener lens with an updated version to improve image uniformity across the field of view; replacement of the last engineering-grade detector in the focal-plane mosaic to complete the focal plane with science-grade devices; completion of the quicklook observing tools for reliable nighttime use; first trial implementation of the science data reduction pipeline; and resolution of the many small problems identified during the first real use on the telescope. On the return to the Mayall telescope in April, we expect that the remaining runs will see a transition from instrument characterization and problem-solving to science verification.
The photometric quality of the FLAMINGOS instrument at the KPNO Mayall 4-meter telescope was recently characterized after removal of the anti-reflective coating in its field lens. This coating had deteriorated and, as a result, images from the instrument exhibited significant variations in the zero-point across the field of view.

We observed a calibration field during a Testing & Engineering night in October 2006 in the JHK bands under good seeing conditions (FWHM~2.5 pixels or 0.7 arcsec). Point-spread-function (PSF) photometry was carried out, adopting a constant PSF over the entire field of view. The photometry was matched to the 2MASS Point Source Catalog. About 1,500 stars in the magnitude range of 9-15 were used in the analysis.

We found that the PSF is constant over 80 percent of the array. Within this area, the zero-point exhibits a very mild quadratic variation (see figure 1) at the < 0.05 mag level. The coefficients of this relation changed slightly from band to band, most likely due to slight differences in the telescope focus as a function of time.

We found that the image quality degrades significantly at larger radii, especially in the left and bottom edges of the array (see figure 2). Users should expect significant degradation in the PSF at X<300 pixels or Y<200 pixels, and plan additional observations with a substantial offset in both directions if they desire accurate photometry of objects located in this section of the array.

Updated information on FLAMINGOS can be found in the “Performance Reports” section of the Kitt Peak instrument manual at www.noao.edu/kpno/manuals/flmn/flmn.html.