Facility Overview

Site Overview

The Lowell Discovery Telescope (LDT) is Lowell Observatory's flagship facility at a dark-sky site approximately 40 miles southeast of Flagstaff on the Coconino National Forest.

We support both in-person and remote observing, with the latter growing significantly in popularity following the COVID-19 pandemic.

Telescope Overview

The LDT sports a 4.3-m thin-meniscus primary mirror supported laterally and axially by an active optics system (AOS). The telescope rides on an elevation over azimuth mount. The LDT's pointing model provides ~2" accuracy over the entire sky down to 5º elevation; the mount is capable of pointing to horizon. The system supports non-sidereal and ephemeris based object tracking in addition to sidereal.

Presently, the telescope is configured for the Ritchey–Chrétien (RC) focus, with an effective focal ratio of f/6.1. The mount is also configured with two large Nasmyth and 6 bent-cassegrain ports for future instrumentation; development of instruments for these would additionally require development of a tertiary mirror.

At the RC focus, a 5-port instrument cube is installed to allow for rapid intranight swapping between instruments (~5 mins). The through-port on the cube has a 0.5º diameter flattened field of view.

Scheduling Overview

LDT is classically scheduled by semester and does not support queue observing at this time. The typical scheduling unit is quarter-nights, but other units may be requested depending on the needs of the science program. Additionally, a given observing program may be spread across non-consecutive nights (or even the entire semester) for scientific or weather concerns.

A Target of Opportunity (ToO) program is supported for programs that observe unpredictable and time critical observations. These can take advantage of both time-sensitive targets and the rapid reconfigurability of the LDT's instruments.

Instrument Overview

LDT hosts three facility instruments and a suite of visitor / PI instruments. The facility instruments are available full-time, and the others have variable availability depending on port competition and PI projects.

Facility Instruments:

Large Monolithic Imager (LMI) – A 6k x 6k optical imager (field of view is 12.3' square) built around a single CCD (e2v CCD231, 15micron pixels). LMI is typically operated binned 2x2 for 0.24" square pixels. A complete set of broadband photometric filters (Johnson-Cousins and SDSS), an astrometric V+R filter, and various stellar and cometary narrow-band filters are available.

DeVeny Optical Spectrograph – A low- to medium-resolution optical spectrograph. DeVeny has a complement of 9 gratings that provide spectral resolution or R ~ 500-4000, and includes various order-blocking filters. The instrument uses a 512 x 2048 CCD camera and is supported by the PypeIt spectroscopic data reduction pipeline.

Near Infrared High Throughput Spectrograph (NIHTS) – A low-resolution (R ~ 100-200) NIR spectrograph capable of covering wavelengths 0.86-2.4 microns in a single setup. NIHTS contains no moving parts and employs a single slit mask that offers 7 different width slits. This instrument may be operated simultaneously with LMI imaging via a dichroic fold flat.

Visitor / PI Instruments:

EXtreme PREcision Spectrometer (EXPRES) – This high-resolution (R~143,000), bench mounted, cross-dispersed echelle spectrograph was built at the Yale Exoplanet Laboratory (PI: D. Fischer) for the purpose of hunting earth-sized exoplanets. It uses both a ThAr lamp and laser-frequency comb for high-precision wavelength calibrations. In addition to its key program, this instrument is available for other science.

Quad-camera, Wave-front-sensing, Six-wavelength-channel Speckle Interferometer (QWSSI) – This speckle imager was built at Lowell Observatory (PI: G. van Belle) and evolved from of the DSSI camera. QWSSI is capable of diffraction-limited observations of closely spaced objects.

Portable Occultation, Eclipse, and Transit System (POETS) – One of the POETS systems is generally available (contact: S. Levine) for high-speed imaging of transient events.

Rapid infrared IMAger Spectrometer (RIMAS) – This near-infrared imager / spectrograph was developed by GSFC and UMd and is arriving in May 2025. There is expected to provide both low- and medium-resolution spectroscopic modes in addition to an imaging mode.