

DeVený Optical Spectrograph

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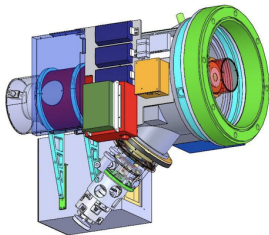
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LDT Facility Instrument – Available Full-Time, Remote Available

Mounting Port: Instrument Cube – Port C (large)

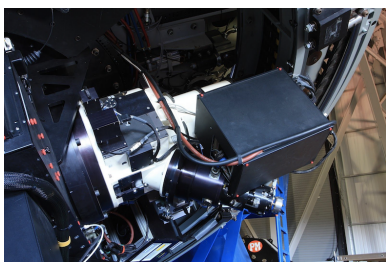
Manual: [DeVený User Manual v1.8 \(16 November 2023\)](#)

Additional Information: [DeVený Gratings / Filters / Lamps](#), [DeVený_Ops_Appendix.tar](#)

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The DeVený Spectrograph is a moderate resolution optical spectrograph working between 3200 Å and 1 µm. R ranges between 500 and 4000 depending upon the grating used. The DeVený spectrograph was built and known at Kitt Peak National Observatory (KPNO) as the KPNO White Spectrograph, and had a long career at the 36" and 84" telescopes there before being retired. Lowell Observatory acquired the spectrograph from KPNO on indefinite loan in 1998. A new CCD camera was built for it, and the instrument was further modified for installation on the 72" Perkins telescope in 2005. Following 8 years of service there, it was removed in 2013 for upgrades for installation on the LDT. The DeVený spectrograph has been in use on the instrument cube since February 2015.

There are currently [10 gratings available for use](#). Five have recently been made available thanks to a long term loan from KPNO and have not yet been well characterized at the LDT. Note that swapping the grating remains a daytime operation to minimize risk.



The DeVeney Spectrograph mounted on Port C of the instrument cube.

What's New

16-November-2023, DeVeney User Manual v1.8 Released

10-May-2022, DeVeney User Manual v1.7.1 Released

14-Nov-2021, DeVeney Image Quality Issue: Stellar PSF's show an elliptical/oblique component that hasn't been resolved yet.

- The ellipticity source is likely from something errant in the optical path from the DeVeney fold mirror to the slit, as it appears in both slitviewer and spectrograph images.
- Pointing and the imaged slit locations have not changed, meaning the slitviewer assembly has not moved.
- The orientation of the ellipse long axis is generally fixed, not changing wrt rotation angle, and thence telescope pupil.
- There may be rotational dependence, with images improving at rotation angles around 90 and 270 deg. This is mostly based on data taken in poor seeing, at about 60 deg El. See the attached file. For the curious this has the DeVeney at 6 O'clock and 12 O'clock when viewed from behind Cass, with the DVY fold mirror stage motion more parallel to the gravity vector.
- The image shape is not astigmatic in the sense that the orientation does not rotate $\pi/2$ when going through focus. When in focus the images are flat-topped, which looks like mis-tracking (unlikely given the exposure times) or high-amplitude and frequency vibration or motion.
- So the most likely culprit would seem to be the fold mirror mount. It is vaguely possible that the hard-stop incident caused this though not clear how. In any case an inspection of the assembly is the next thing to do. The earliest opportunity for this is the week of Nov 29, and POETS will need to come off temporarily.
- In the meantime, if practical, observers could consider setting the sky PA such that the rotator position is in the vicinity of 90 or 270 deg. This obviously won't help the normal fixed tracking at 180 deg. If focused, objects should have minimal losses for slit widths > 1.5 arcsec, depending on seeing.

29-Apr-2021, Order-Blocking Filters: The GG495 filter has been removed from the instrument; replacement plan TBD.

- Order-blocking filters GG420 and OG570 are still in service.

Instrument Quick Facts:

- Spectral Channel CCD
 - Detector: e2v CCD42-10 deep depletion device: 2048×512 $13.5 \mu\text{m}$ pixels ($27.65 \text{ mm} \times 6.91 \text{ mm}$)
 - Slit Length: 2.5 – Pixel Scale: 0.34/pixel (spatial direction, unbinned)
 - Gain: 1.52 e /ADU – 16-bit ADC; Full-Well: 100k e
 - Read Noise: 3.2 ADUs, about 4.9 e
 - Typical bias level: 2370 ADU (ambient temperature dependent)
 - CCD Normal Operating Temperature: 110C
 - Linearity: Linear to 97% of saturation (63, 500 ADU)
 - Readout Time: 8 s (unbinned)
 - Dark Current: 4.5 e /h = 0.0013 e /s
 - Fringing: 1-3% fringe amplitudes, redward of 8000 Å
- Slit Viewing Camera
 - Model: Lodestar X2 by Starlight Xpress
 - Pixel Scale: 0.253"/pixel (binned 2×2)
 - Image Size: 376×290 pixels
 - Field of View: $95'' \times 73''$
- Grating Complement
 - Collection of 10 gratings that were used with the KPNO White and Gold spectrographs
 - $128 \times 154 \text{ mm}$ plane reflection gratings
 - Range of spectral resolution from R 500 4000
 - 1st order blazed gratings
 - Motorized grating tilt angle stage to select central wavelength on the CCD
 - See [DeVeney Gratings / Filters / Lamps](#) for specifications
- Calibration Lamps
 - For wavelength calibration, there are four remotely-controlled AC-powered pencil-style gas discharge arc lamps:
 - Neon (5800 8600 Å)
 - Argon (6900 9700 Å)
 - Mercury (3300 5800 Å)
 - Cadmium (3200 5500 Å)
 - The primary dome flat field calibration lamps are on the top ring of the secondary mirror support structure.
- Data Reduction Software
 - Pyppelt data reduction pipeline ([Appendix H](#); <https://pyppelt.readthedocs.io/en/latest/>)
 - IRAF (<https://iraf-community.github.io/>)