

# Progress on the Coudé f/4 High-Resolution Spectrograph Project

As 1990 draws to a close we thought it appropriate to report on the progress on the high-resolution coudé f/4 spectrograph. This instrument will provide spectroscopists a spectral resolving power of 120,000, from the atmospheric cutoff near 3000 Å to 1 micron. The optical concept centers on the use of a 316 groves/mm mosaic echelle grating that works at a blaze angle of 63.5 degrees. The schematic layout is shown in Figure 6, and to those familiar with the existing f/8.2 coudé spectrograph, it will look quite familiar. The detailed differences are important, however.

The final optical design was completed by Harvey Richardson of the Dominion Astrophysical Observatory in the late Spring of 1990. In the final version the order sorting is accomplished either by use of bandpass filters in a filter wheel just behind the slit, or by variable gratings located in the diverging f/20 beam not far from the slit area. There will be three gratings mounted on a turntable. Each grism will consist of two identical wedge prisms in oiled contact with each other, with the last surface oiled to a thin prism that will have a coarse transmission grating replicated onto the other surface. A rotation mechanism driven by a stepper motor will counter-rotate the two wedge prisms to create a prism vertex angle appropriate for the grating angle being changed simultaneously. With such a mechanism the observer will be able to precisely select the wavelength transmitted with zero deviation, and, hence, be accurately positioning the spectrum on the detector.

The light then goes to the spherical collimator mirror (with an f/20 beam there is no significant difference between a sphere and a paraboloid.) A motorized Hartmann mask assembly in front of the collimator will have several small masks that can be opened and closed in various combinations to allow careful focussing with one of the four echelles, then be used to align the spectra from the other three echelles relative to the first. The mosaic echelle mounting cell is currently being fitted with motors on two rotation axes for each echelle, permitting remote control of this procedure.

The f/4 (monochromatic) camera uses a parabolic mirror in combination with a three element corrector lens assembly. There will be two corrector assemblies, one for the UV-blue, and the second for the blue-red wavelength ranges. The second element of these lenses will actually be built onto the surfaces of a

45 degree prism that also directs the light beam downward towards the upward-looking detector.

The detector will be carried by a motorized support unit identical to the one being designed by Wiley Knight at CFHT for the f/8.2 spectrograph that provides six motions — three linear and three rotational, again all being remotely controllable.

In January 1990, CFHT and the DAO signed a contract that has the DAO providing not only the optical design, but also the mechanical design and fabrication of the order sorting filter wheel, the grism assembly, the Hartmann mask unit, the echelle cell modifications, the mosaic rotation table, the supports and cells for both the collimator and camera mirrors, and the electrical control system design specifications. All mechanical design work was completed by mid-Summer of 1990, about the same time as the initial machine shop work was starting. Much of the control system specifications were available by June 1990, and the low-level code for the control microcomputer arrived in Hawaii in October. If no delays turn up during the fabrication process, all major mechanical components will be finished before the start of Summer, 1991.

Purchase orders for the collimator and camera mirrors were signed in early September, with delivery expected in mid-1991. The small optical components were handled separately, with the purchase order going out in early December, 1990. Still to be ordered are the image slicers. The slit environment will be designed at CFHT, the mechanisms being for the most part copies of those now used for the f/8.2 spectrograph.

Delivery of all components is expected for Fall, 1991, with commissioning work on the sky early in the first semester of 1992. Since this is about the same schedule as currently exists for the MOS/SIS, this is certain to be an active time at CFHT!

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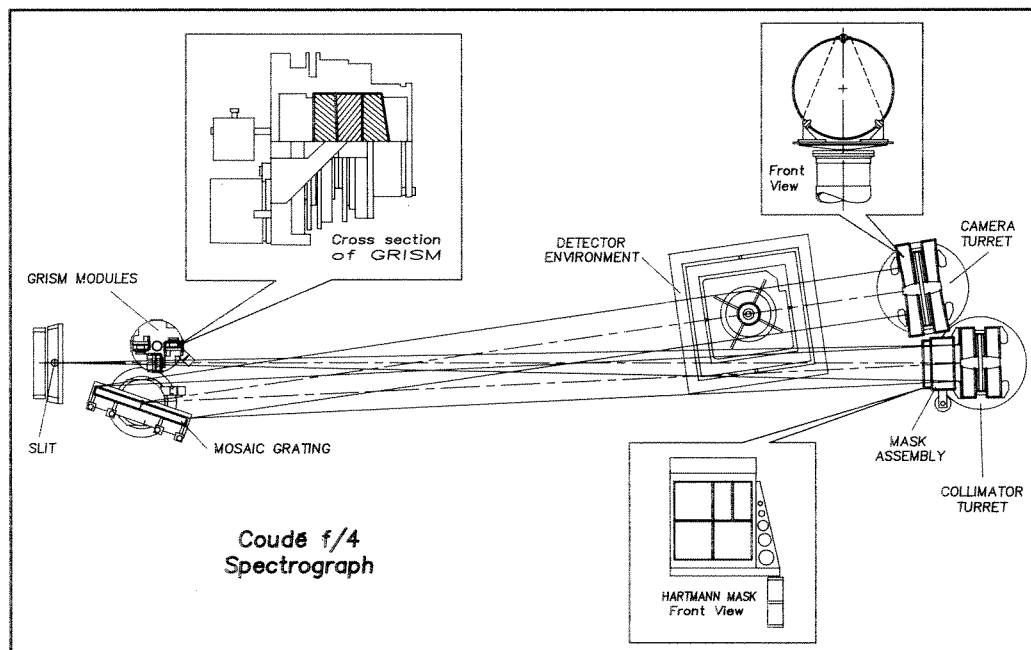


Figure 6: Schematic layout of the coudé f/4 spectrograph as seen from above. Details are shown of the grism turntable, the Hartmann mask unit in front of the collimator, and the supports for the collimator and camera mirrors.