FICK OBSERVATORY SPECTRUM SCANNERS

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ABSTRACT. Three low-dispersion (15-50 A/mm)$^{-1}$ spectrum scanners have been developed at Fick Observatory as instrumentation for small telescope research and teaching activity. They have been applied in solar eclipse, zodiacal light, stellar, and comet research programs. The two plane grating spectrometers and one holographic grating instrument have been employed on telescopes ranging from 7.6 to 61 cm aperture, generally with f/5 to f/8 configurations. Recently, one of the plane grating instruments has been modified to perform as a four-channel spectrometer for quantitative spectral classification and composite spectra studies. This instrument is also being used to make spatial-spectral studies of the coma of Comet Halley, and other recent comets.

1. HOLOGRAPHIC GRATING SCANNER

A Type IV aberration corrected concave holographic grating with 1200 grooves/mm is the only optical element in one scanner. Although capable of operation up to about f/4, this instrument is generally employed at f/8 with a single photomultiplier. However, provision is provided for a simultaneous two-cell (sky and star) mode. The reciprocal dispersion is about 40 A/mm. Scanning of the spectrum across the exit slot is performed by rotating the grating. A microcomputer is employed for data recording and managing the programmed scans over the selected wavelength regions. Recently the holographic scanner has been used most frequently with the 37 cm Cassegrain telescope in comet coma and tail studies.

2. PLANE GRATING SCANNERS

Two low-dispersion (15-50 A/mm)$^{-1}$ plane grating instruments are in use at Fick Observatory. Both are converted commercial spectrometers. One is a crossed 0.28 m Czerny-Turner configuration, and the other is a 0.25 m Ebert instrument. At times both are employed as photoelectric radial velocity spectrometers using masks with selected solar lines in

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solar eclipse and Zodiacal light experiments with f/5 7.6 cm refracting telescopes (Beavers et al., 1980).

For stellar and comet work the scanners are used on the 61 cm and 37 cm Cassegrain telescopes at Fick Observatory. Recently, the Ebert instrument has been modified to perform as a four-channel system by providing provision for four separate photomultipliers behind the output focal plane. A mask is used to define the spectral band measured in each of the output channels. The mask may be changed quickly under computer control by displacing it perpendicular to the dispersion. Thus it is possible for each channel to be used to compare signals from the chosen spectral line region and the adjacent continuum. The four-channel system is currently being employed at f/8 on the 61 cm Cassegrain telescope with line and continuum band passes of 100 to 150 A for measurements of molecular emission bands in cometary coma. The telescope is programmed to sample a grid of positions centered on the comet for the four-channel system measurements in order to produce a combined spatial-spectral study of the comet.

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3. REFERENCE

Beavers, W. I., Eitter, J. J., Carr, P. H., and Cook, B. C. 1980, Ap. J. **238**, 349.

DISCUSSION

Millis: 1) What spatial resolution will you be able to get on Comet Halley? 2) How far will you have to move off the comet to reach the true sky background?

Beavers: 1) On both our telescopes, 61 cm and 37 cm, we operate at f/8. These give slit scales (arc sec/mm) of 42 and 70, respectively. 2) Not really sure, except we want to reach the background in both the solar and anti-solar directions.