THE TESTING AND ADJUSTMENT OF LYOT-ÖZMAN FILTERS
(Research Note)

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To determine the line profile of a Lyot-Özman filter, an instrument with a spectral resolution greater than that of the filter is required, usually a grating spectrograph (Van Griethuysen and Houtgast, 1959). Alternatively, we describe below the use of an automatically controlled scanning Fabry-Perot interferometer (Ramsay, 1966) for this purpose.

The plates of this interferometer are mounted on rods of the piezoelectric material barium titanate, the parallelism being controlled automatically independent of plate spacing using white-light superposition fringes for testing purposes. In addition, the interferometer is equipped with a small, dimensionally stable wedge-shaped calibrated reference interferometer. The main interferometer can similarly be controlled to transmit the same wavelength as a selected aperture of this calibrated reference interferometer. Alternatively, if the interferometer is used in a scanning mode, the superposition fringes between the reference interferometer and the main working interferometer may be used for wavelength calibration during scanning. Further details of the interferometer are available in Ramsay (1966).

We have used this instrument in the scanning mode when testing birefringent filters. The filter is illuminated by collimated light from a Pointolite source and the transmitted radiation is scanned by the interferometer. The spectral content of the transmitted radiation (the line profile) is displayed on one channel of a two-pen recorder whilst the superposition fringes between the reference and working interferometers is displayed on the other channel. A typical result is shown in Figure 1. The overall operation is simple and rapid: the interpretation of the results is very convenient and the line profile can be plotted immediately an adjustment is made. The resolution of the interferometer may readily be chosen to suit the bandwidth of the filter under test.

The method we have used to adjust our filters is as follows. Suppose the filter has two tunable elements, A and B, and let B have the higher resolving power. Effectively take B out of the system (by removing its appropriate polaroid), then rotate the polaroid which tunes A until the two pass-bands which appear are of the same amplitude. Note the orientation of the polaroid. Then rotate the polaroid approximately 180° and repeat. Half-way between these two orientations is the position to which element A should be adjusted for synchronism with the preceding (lower resolution) elements. Bring element B into the system and rotate polaroid B until the side bands are again equal, repeating with B rotated through approximately 180°. Polaroid B
should now be adjusted to half-way between these orientations. The two tunable elements are now in optimum adjustment. The temperature at which the filter transmits $H\alpha$ is determined by changing it until the maximum of the reference fringe (denoting $H\beta$) and the maximum transmitted by the interferometer occur simultaneously during the interferometer scan.

Of three filters which we have tested, none has been in optimum adjustment when received from the manufacturer. When a filter in optimum adjustment is tuned off the line centre, the profiles in the red and blue wings should be mirror images of each other. The upper part of Figure 2 shows profiles of a filter as received from the manufacturer (note the minimum near the $H\alpha$ position!); below are the profiles when

Fig. 1. The line profile is displayed in the upper trace and the reference fringes in the lower. The half-width of the scanning interferometer is $0.1 \pm 0.01$ Å and the interorder spacing is $2.9$ Å.