Achromatic Prism

BK7 : $n_d - 1 = .51680$

$P_1 = .308$

$\nu_1 = 64.17$

F2 : $n_d - 1 = .62004$

$P_2 = .294$

$\nu_2 = 36.37$

$\nu_1 - \nu_2 = 27.80$

a) Achromatic Prism

$\delta = 30$ arc min $= 0.5$ deg

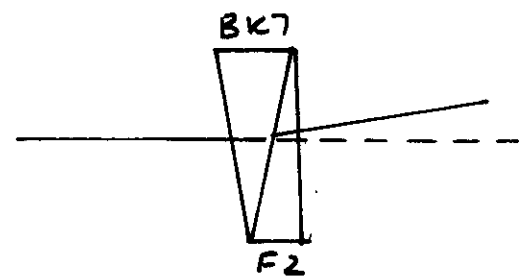
$= .0087$ rad

$$\frac{\alpha_1}{\delta} = -\left(\frac{1}{\nu_1 - \nu_2}\right)\left(\frac{\nu_1}{n_{d_1} - 1}\right) = -4.47$$

$$\boxed{\alpha_1 = -.0388 \text{ rad} = -2.22^\circ}$$

$$\frac{\alpha_2}{\delta} = \left(\frac{1}{\nu_1 - \nu_2}\right)\left(\frac{\nu_2}{n_{d_2} - 1}\right) = 2.11$$

$$\boxed{\alpha_2 = .0183 = 1.05^\circ}$$



Secondary Dispersion:

$$\frac{\varepsilon}{\delta} = \left(\frac{1}{\nu_1 - \nu_2}\right)(P_1 - P_2) = .000504$$

$$\boxed{\varepsilon = 4.38 \times 10^{-6} \text{ rad}}$$

$$\boxed{\varepsilon = 2.5 \times 10^{-4} \text{ deg} = .9''}$$

b) BK7 Wedge with same δ

$$\delta = -\alpha (n_d - 1)$$

$$\alpha = \frac{-\delta}{n_d - 1} = -.0168 \text{ rad}$$

$$\boxed{\alpha = -.96 \text{ deg}}$$

Dispersion:

$$\Delta = \frac{\delta}{v} = \frac{.0087}{64.17}$$

$$\Delta = 1.35 \times 10^{-4} \text{ rad}$$

$$= 7.76 \times 10^{-3} \text{ deg} = 28''$$

$$\boxed{\frac{\varepsilon \text{ (achromat)}}{\omega \text{ (BK7)}} = \frac{2.5 \times 10^{-4} \text{ deg}}{7.76 \times 10^{-3} \text{ deg}} = .032}$$

A factor of 30 improvement in color smear results from using an achromatic wedge instead of a simple wedge.