Error propagation for simple methods for Wollaston polarization.

$$\begin{aligned} Q &= \left(A_1 - B_1\right) - \left(A_2 - B_2\right) \\ I &= A_1 + B_1 + A_2 + B_2 \sim 4A_1 \end{aligned} \tag{1.1}$$

Let

$$\varepsilon_{A_1} \sim \varepsilon_{B_1} \sim \varepsilon_{A_2} \sim \varepsilon_{B_2} = \varepsilon \tag{1.2}$$

Then

$$\varepsilon_Q = \varepsilon_I = 2\varepsilon \tag{1.3}$$

Now $q = Q / I$ so

$$\begin{aligned} \varepsilon_q &= \sqrt{\left(\frac{\partial q}{\partial Q}\right)^2 4\varepsilon^2 + \left(\frac{\partial q}{\partial I}\right)^2 4\varepsilon^2} \\ \varepsilon_q &= 2\varepsilon\sqrt{\left(\frac{1}{I}\right)^2 + \left(\frac{-Q}{I^2}\right)^2} \\ \varepsilon_q &= \frac{2\varepsilon}{I}\sqrt{1+q^2} \simeq \frac{\varepsilon_{A_1}}{2A_1} \end{aligned} \tag{1.4}$$

Since $\varepsilon_p \sim \varepsilon_q \sim \varepsilon_u$

$$\varepsilon_p \sim \frac{\varepsilon_A}{2A} \sim \frac{\varepsilon_B}{2B} \tag{1.5}$$