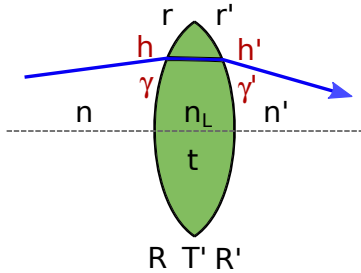


Tlustá čočka



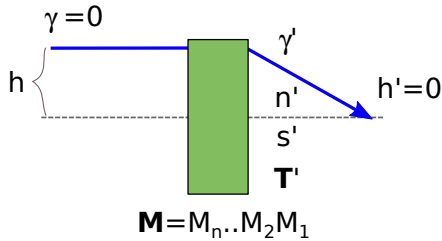
$$\begin{pmatrix} h' \\ n'\gamma' \end{pmatrix} = \mathbf{M} \begin{pmatrix} h \\ n\gamma \end{pmatrix}$$

$$\mathbf{M} = \mathbf{R}' \mathbf{T} \mathbf{R} = \begin{pmatrix} 1 & 0 \\ -\varphi' & 1 \end{pmatrix} \begin{pmatrix} 1 & t/n_L \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ -\varphi & 1 \end{pmatrix} = \begin{pmatrix} 1 - \varphi \frac{t}{n_L} & \frac{t}{n_L} \\ -\varphi' - \varphi + \varphi\varphi' \frac{t}{n_L} & 1 - \varphi' \frac{t}{n_L} \end{pmatrix}$$

$$\varphi' = \frac{n' - n_L}{r'}$$

$$\varphi = \frac{n_L - n}{r}$$

$$\hat{\varphi} = \varphi' + \varphi - \varphi\varphi' \frac{t}{n_L}$$



fokusace:
$$\begin{pmatrix} 0 \\ n'\gamma' \end{pmatrix} = \mathbf{T}' \mathbf{M} \begin{pmatrix} h \\ 0 \end{pmatrix}$$

$$\mathbf{T}' \mathbf{M} = \begin{pmatrix} 1 & s'/n' \\ 0 & 1 \end{pmatrix} \begin{pmatrix} A & B \\ C & D \end{pmatrix} = \begin{pmatrix} A + \frac{s'}{n'} C & B + \frac{s'}{n'} D \\ C & D \end{pmatrix}$$

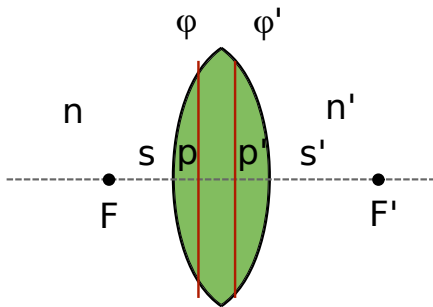
$$\frac{s'}{n'} = -\frac{A}{C}$$

Hlavní roviny

tlustá čočka:
$$\mathbf{M} = \begin{pmatrix} 1 - \varphi \frac{t}{n_L} & \frac{t}{n_L} \\ -\hat{\varphi} & 1 - \varphi' \frac{t}{n_L} \end{pmatrix} \quad \hat{\varphi} = \varphi' + \varphi - \varphi \varphi' \frac{t}{n_L}$$

$$\frac{s'}{n'} = -\frac{A}{C} : \quad s' = n' \left(1 - \varphi \frac{t}{n_L} \right) / \hat{\varphi} = \frac{n'}{\hat{\varphi}} - \frac{n' \varphi t}{n_L \hat{\varphi}} = f' + p'$$

$$\hat{\varphi}' = \frac{n'}{f'} \quad p' = -\frac{\varphi t}{n_L \hat{\varphi}}, \quad \text{obdobně} \quad p = -\frac{\varphi' t}{n_L \hat{\varphi}}$$

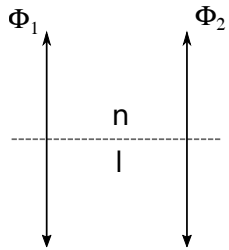


celkem

$$\mathbf{M} = \begin{pmatrix} 1 + p' \hat{\varphi} & \frac{t}{n_L} \\ -\hat{\varphi} & 1 + p \hat{\varphi} \end{pmatrix} \quad \hat{\varphi} = \varphi' + \varphi - \varphi \varphi' \frac{t}{n_L}$$

Řazení čoček

tenká čočka:
$$\Phi = \begin{pmatrix} 1 & 0 \\ -\hat{\varphi} & 1 \end{pmatrix} \quad \hat{\varphi} = \varphi' + \varphi - \varphi\varphi' \frac{t}{n_L}$$



dvoukomponentní systém:

$$\mathbf{M} = \Phi_2 \mathbf{T} \Phi_1 = \begin{pmatrix} 1 - \hat{\varphi}_1 \frac{l}{n} & \frac{l}{n} \\ -\hat{\varphi}_1 - \hat{\varphi}_2 + \hat{\varphi}_1 \hat{\varphi}_2 \frac{l}{n} & 1 - \hat{\varphi}_2 \frac{l}{n} \end{pmatrix}$$

pro podobnost s tlustou čočkou se jedná o zásadní konstrukci:

dalekohled, mikroskop, fokometr
objektiv, okulár
brýlová korekce
hierarchické skládání

$$\hat{\Phi} = \hat{\varphi}_1 + \hat{\varphi}_2 - \hat{\varphi}_1 \hat{\varphi}_2 \frac{l}{n}$$

sečná ohnisková vzdálenost \rightarrow pracovní vzdálenost