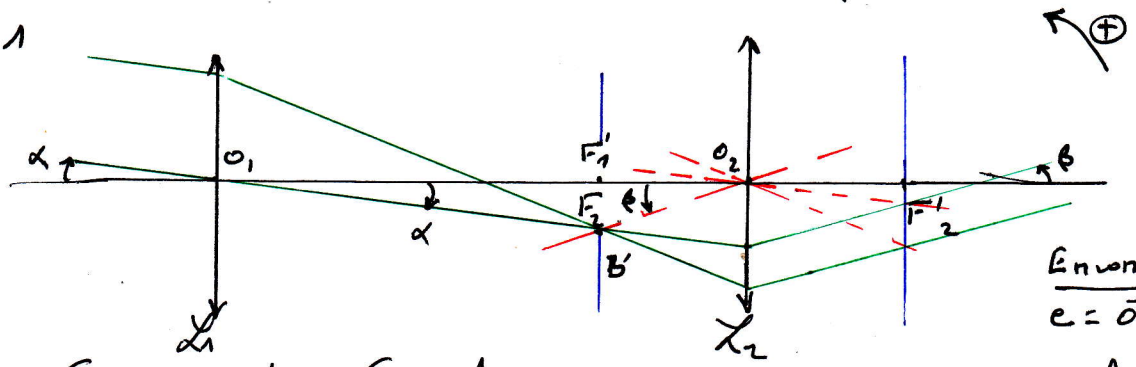
OP022 - Principe d'une lunette astronomique.

1



Encombrement

$e = \overline{O_1O_2} = f_1' + f_2'$

A.N: $e = 52$ cm.

Grossissement : $G = \frac{\beta}{\alpha}$

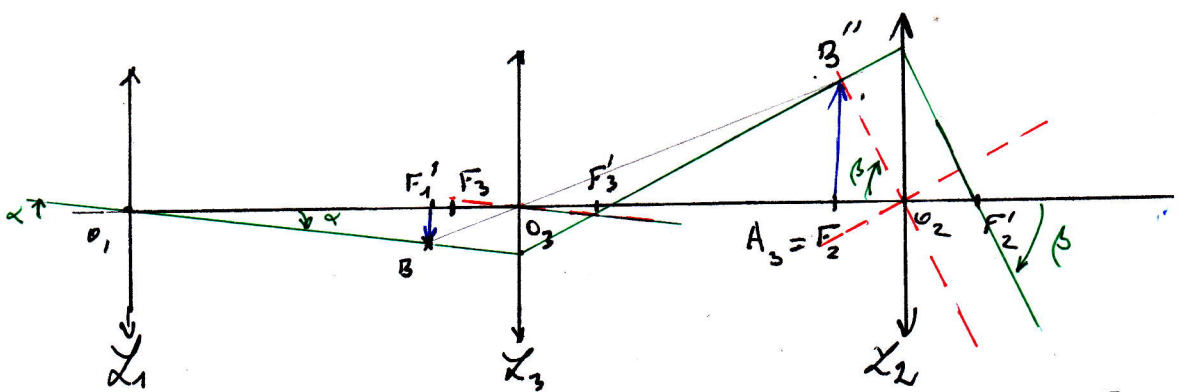
Dans les conditions de Gauss : $\beta = \frac{\overline{F_2B'}}{\overline{O_2F_2}} = \frac{\overline{F_2B'}}{-f_2'}$

$\alpha = \frac{\overline{F_2B'}}{\overline{O_1F_1'}} = \frac{\overline{F_2B'}}{f_1'}$

$\Rightarrow \boxed{G = -\frac{f_1'}{f_2'}}$

Rq : $G < 0$: image renversée.

2. $A_\infty \xrightarrow{\mathcal{L}_1} F_1' \xrightarrow{\mathcal{L}_3} A_3 = F_2'' \xrightarrow{\mathcal{L}_2} A_\infty'$



$\mathcal{L}_3$ doit renverser l'image intermédiaire donc $\gamma_3 = \frac{\overline{O_3A_3}}{\overline{O_3F_1'}} < 0$

De plus $|\gamma_3| = 3 \Rightarrow \boxed{\frac{\overline{O_3A_3}}{\overline{O_3F_1'}} = -3}$

Grossissement : $G' = \frac{\beta}{\alpha} = \frac{\overline{F_2B''}}{\overline{O_2F_2}} \Big/ \frac{\overline{F_1'B}}{\overline{O_1F_1'}}$ or $\frac{\overline{F_2B''}}{\overline{F_1'B}} = \gamma_3 = -3$

$$\therefore \boxed{G' = -3G = 3\frac{f_1'}{f_2'}}$$

Encombrement de la lunette : $e' = \overline{O_1O_2} = \overline{O_1F_1'} + \overline{F_1'O_3} + \overline{O_3F_2} + \overline{F_2O_2}$

$e' = f_1' + f_2' + \overline{F_1'O_3} - 3\overline{O_3F_1'} = f_1' + f_2' + 4\overline{O_3F_1'}$

Relation de conjugaison pour $\mathcal{L}_3$: $\frac{1}{\overline{O_3F_2}} - \frac{1}{\overline{O_3F_1'}} = \frac{1}{f_3'}$ $\xrightarrow{\times \overline{O_3F_1'}}$ $\frac{\overline{O_3F_1'}}{\overline{O_3F_2}} - 1 = \frac{\overline{O_3F_1'}}{f_3'}$

$\rightarrow \frac{1}{\gamma_3} - 1 = \frac{\overline{O_3F_1'}}{f_3'} \Rightarrow \overline{O_3F_1'} = \frac{f_3'}{\gamma_3} - 1 \Rightarrow \boxed{e' = f_1' + f_2' - 4\left(\frac{f_3'}{\gamma_3} - 1\right)}$ $\boxed{e' = e + 6{,}7 \text{ cm}}$.