

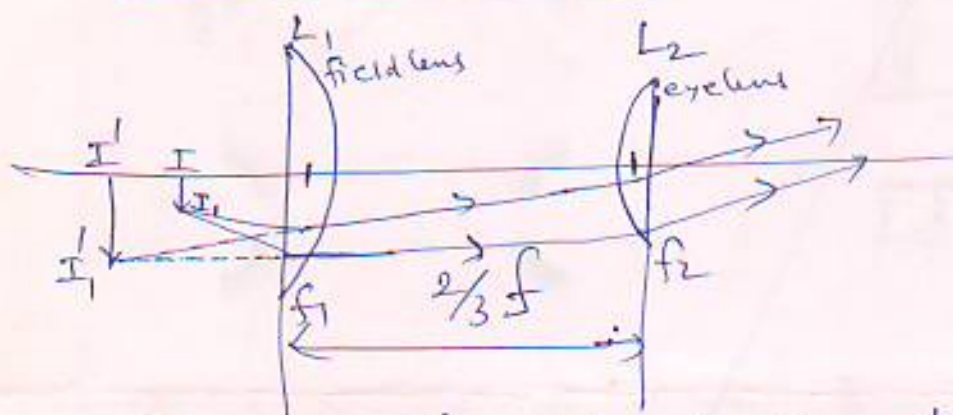
Ramsden eye piece

(1)

It consists of two plano-convex lenses. The focal lengths of the two lenses are equal.

The distance between the lenses is $\frac{2}{3}$ of the focal length of the lenses.

The convex faces are facing each other.



$F \rightarrow$ focal length of the equivalent lens (the combination)

$$\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{d}{f_1 f_2}$$

$$\frac{1}{F} = \frac{1}{f} + \frac{1}{f} - \frac{\frac{2}{3}f}{f \cdot f}, \quad \frac{1}{F} = \frac{1}{f} + \frac{1}{f} - \frac{2}{3f}$$

$$\frac{1}{F} = \frac{2}{f} - \frac{2}{3f} = \frac{6 - 2}{3f} = \frac{4}{3f}$$

$$\boxed{F = \frac{3}{4}f}$$

I_1 is the ~~object~~ ^{inverted} real object in front of the field lens. The rays from ~~the~~ the object are refracted on falling on the field lens and the image

4. Formed ^{at infinity} ~~at~~ after refraction through the eye lens. (2)

~~Cross~~ Chromatic aberration in Ramsden's eye piece is very small. The spherical aberration is also small because the convex surfaces of the plano-convex lenses are facing each other.

Comparison of eye pieces

S.No	Huygen's eyepiece	Ramsden's eyepiece
1.	-ve eye piece. The image formed by the objective lies after the field lens (i.e. between the field and eye lenses) \therefore <u>Cross wires</u> <u>can not</u> be used	It's a positive eye piece. The image formed by the objective lies before the field lens (in front). \therefore <u>Cross wires</u> <u>can be used</u>
2.	The <u>condition for minimum spherical aberration</u> is <u>satisfied</u>	The <u>condition for minimum spherical aberration</u> is <u>not fully satisfied</u> .
3.	Condition for <u>chromatic aberration</u> is <u>satisfied</u> .	Condition for <u>chromatic aberration</u> is <u>not fully satisfied</u>
4.	If it is <u>achromatic</u> for <u>all colors</u> .	If it is <u>achromatic</u> for <u>only 2 chosen colors</u>
5.	<u>Other forms of aberrations</u> (distortion etc) <u>not well removed</u>	<u>Other aberrations</u> are <u>better removed</u> .

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Huygens

Ramsden

3

Its power is +ve
($\frac{1}{f}$) (1/focal length in metres)

Its power is -ve

~~3~~