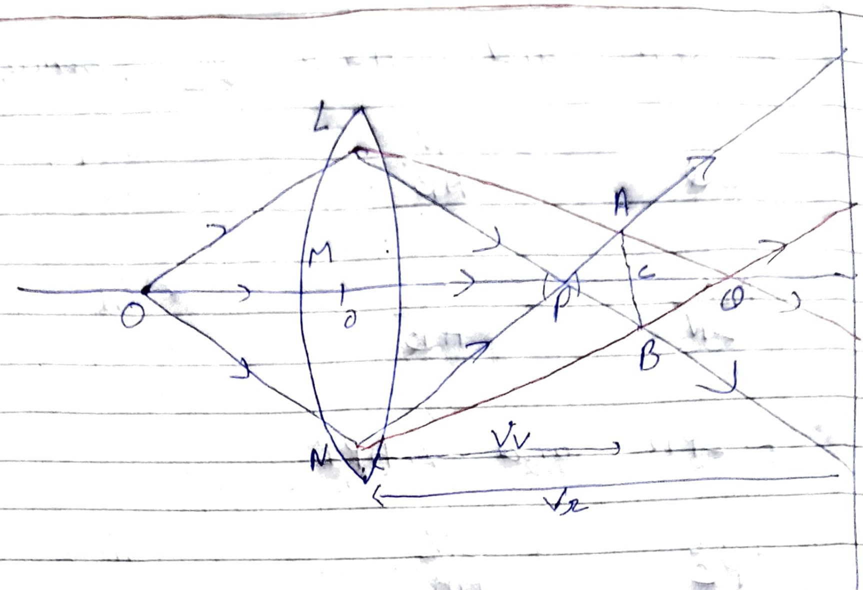
Circle of Least chromatic Aberration



If a screen is placed perpendicular to principle axis than a image in form of circular patches formed at the screen.

The outer ring is violet and inner ring is red.

When screen is kept near to lens than size of circular patches decreases and at AB the diameter of image is minimum. This circle is known as circle of least chromatic Aberration.

Let be the aperture of lens

$$LN = D$$

d is the diameter of circle of least chromatic aberration

$$AB = d$$

$$MQ + MP = V_r + V_v$$

$PQ = MQ - MP = V_r - V_v$

ΔLQN and ΔAQB are similar

$$\frac{MQ}{CQ} = \frac{LN}{AB} \quad \text{---(i)}$$

$$\frac{MQ}{LN} = \frac{CQ}{AB} \quad \text{---(ii)}$$

ΔLPN and ΔAPB

$$\frac{PM}{PC} = \frac{LN}{AB} \quad \text{---(iii)}$$

$$\frac{PM}{LN} = \frac{PC}{AB} \quad \text{---(iv)}$$

(ii) and (iv)

$$\frac{MQ}{LN} + \frac{PM}{LN} = \frac{CQ}{AB} + \frac{PC}{AB}$$

$$\frac{1}{LN}(V_r + V_v) = \frac{1}{AB}(PQ)$$

(axial chromatic $V_r - V_v = \frac{\omega V^2}{f}$)

$$\frac{1}{D}(V_r + V_v) = \frac{1}{d}(V_r - V_v)$$

$$\{V_r + V_v = 2V\}$$

$$\frac{2V}{D} = \frac{1}{d} \times \frac{\omega V^2}{f}$$

$$\boxed{d = \frac{1}{2}\frac{D\omega V}{f}}$$