

Answer on Question #50696, Physics, Optics

- a) Discuss Rayleigh's criterion for resolving power of an optical instrument. Obtain an expression for the resolving power of a microscope.
- b) A He-Ne laser emits a beam of diameter $2 \times 10^{-3} \text{ m}$ and wavelength 630 nm. It is directed towards an aeroplane flying at a height of 11 km. Calculate the diameter of the light patch produced on the surface of the aeroplane.

Answer:

a) The Rayleigh criterion is the generally accepted criterion for the minimum resolvable detail - the imaging process is said to be diffraction-limited when the first diffraction minimum of the image of one source point coincides with the maximum of another.

b)

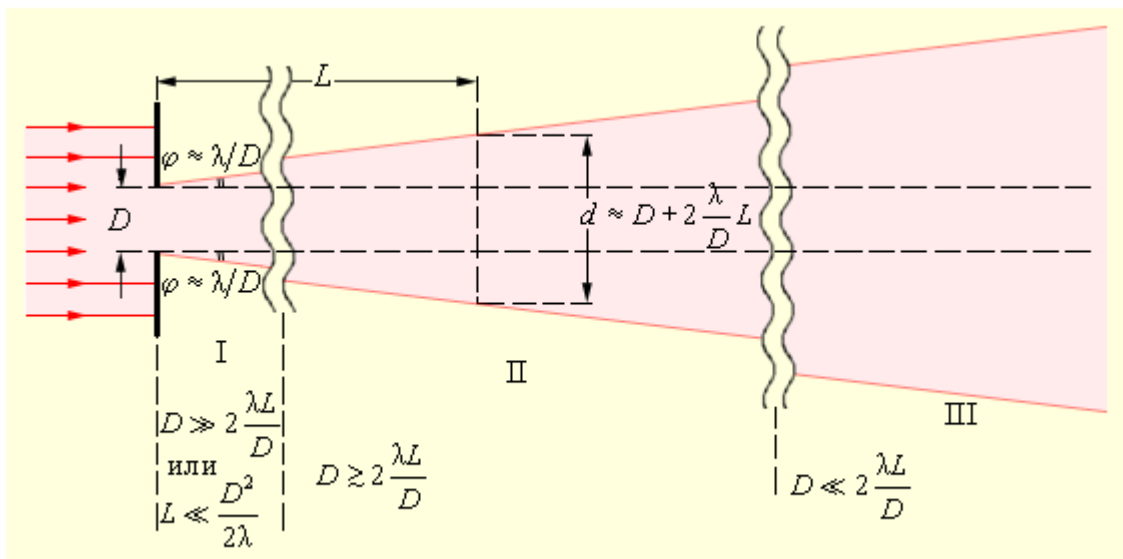


Fig.1

See Fig.1

$$d = D + 2 \frac{\lambda}{D} L = 2 \cdot 10^{-3} + 2 \cdot \frac{630 \cdot 10^{-9}}{2 \cdot 10^{-3}} \cdot 11 \cdot 10^3 = 6.93 \text{ m}$$