Interference at an air wedge

- **What are coherent sources of light?**

  Coherent sources of light are those sources of light which emit light waves of same wavelength, same frequency and have zero or constant phase difference.

- **What are incoherent sources of light?**

  Two independent sources of light whose light waves do not have a constant phase difference are called incoherent sources.

- **What is interference of light waves?**

  The phenomenon of redistribution of light intensity due to superposition of light waves from two coherent sources of light is called interference of light.

- **What is constructive interference?**

  At points where the crest of one wave falls on the crest of another wave, the amplitude of the resulting wave becomes maximum. Hence the intensity of light at such points becomes maximum. This is called constructive interference.

- **What is destructive interference?**

  At some other points where the trough of one wave falls on the crest of another wave, amplitude of the resulting waves becomes minimum. Hence the intensity becomes minimum. This is called destructive interference.

- **What is interference due to division of wavefront?**

  A beam allowed to fall on two closely spaced holes (or slits) and the two beams emanating from the holes interfere.

- **What is interference due to division of amplitude?**

  A beam divided at two or more reflecting surfaces and the reflected beams interfere.

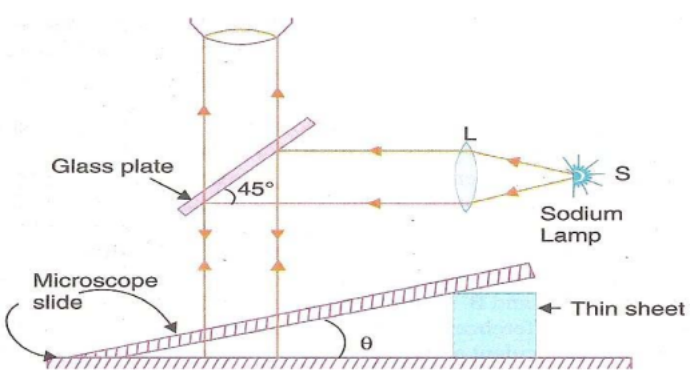

Figure 1: Experimental setup of air wedge experiment

- **What is the aim of the experiment?**

  To determine the thickness of the given paper or sheet by observing interference at an air wedge.

- **Why is the experiment called interference at an air wedge?**

  Thin sheet is kept at one of the edges of the glass slide, and another slide is kept on top of it, an air wedge is formed in between. The two beams reflected from the bottom and the top of the wedge shaped air film of varying thickness interfere.

- **Why do we see bright and dark fringes (interference pattern)?**

  Light from the sodium lamp after reflection at the glass plate reaches the top glass slide. Some part of the light reflects, some part passes through and reaches the bottom glass slide and reflects. There is phase difference between light rays reflected from the top and bottom glass slides thereby showing interference of light.

- **What is the least count of the traveling microscope used in the experiment? How is it calculated?**

- **What is the purpose of using a traveling microscope in the experiment?**

  The traveling microscope is used for two purposes. The interference fringes formed are very small to be seen by the naked eye hence we have to magnify it. Also, it is used measure the fringe width.

- **What is monochromatic light?**

  Light wave of single wavelength or single colour. The sodium lamp is a monochromatic light source producing yellow light of wavelength λ=5893×10^{-10} m.

- **How is the thickness of the sheet determined by measuring fringe width?**

  Thickness of sheet and fringe width are related as

$$t = \frac{\lambda L}{2\beta},$$

  where
  t is the thickness of the sheet,
  L is the length of air wedge,
  β is the fringe width,
  λ is the wavelength of light used.

  Based on the thickness of the sheet placed, the angle of the air wedge will be decided. For different angle θ, the fringe width will be different. Therefore, by measuring the fringe width we determine the thickness of the paper.

- **Instead of using yellow light, if we used red light, will fringe width β increase or decrease?**

  Since β is directly related to wavelength λ, fringe width will increase when red light is used.