Answer on Question #39439, Physics, Optics

What are the conditions of Young's double experiment?
What is monochromatic light?

Answer:

In Young's experiment, two very narrow parallel slits, separated by a distance d, are cut into a thin sheet of metal. Monochromatic light, from a distant light-source, passes through the slits and eventually hits a screen a comparatively large distance L from the slits. The experimental setup is sketched in Fig. 1.

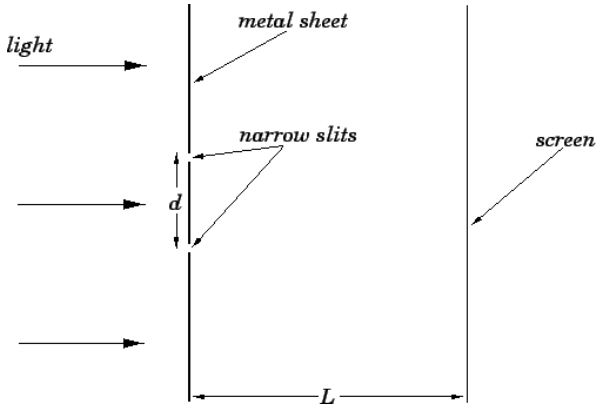

Figure 1: Young's double-slit experiment.

According to Huygens' principle, each slit radiates spherical light waves. The light waves emanating from each slit are superposed on the screen. If the waves are π out of phase then destructive interference occurs, resulting in a dark patch on the screen. On the other hand, if the waves are completely in phase then constructive interference occurs, resulting in a light patch on the screen.

Conditions for interference:

- The sources must be coherent (if two waves have a definite phase relationship then they are coherent).
- The sources should be monochromatic.
  In physics, ***monochromatic light*** refers to electromagnetic radiation of a single frequency (a single wavelength).

The general condition for constructive interference on the screen is simply that the difference in path-length Δ between the two waves be an integer number of wavelengths:

$$\Delta = m\lambda$$

where m=0, 1, 2, ...

The general condition for destructive interference on the screen is that the difference in path-length between the two waves be a half-integer number of wavelengths:

$$\Delta = \left(m + \frac{1}{2}\right)\lambda$$

where m=1, 2, 3, ...