

Interference

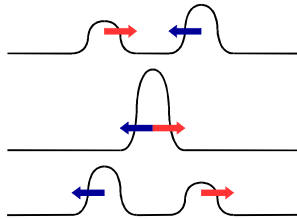
Electric fields from two different sources at a single location add together. The same is true for magnetic fields at a single location.

Thus, interacting electromagnetic waves also add together.

Interference

The addition of waves is called interference and may be constructive or destructive.

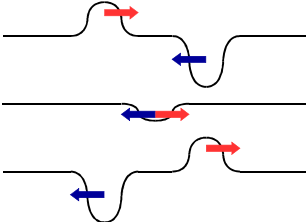
Constructive:



Interference

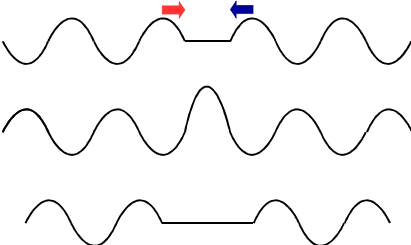
The addition of waves is called interference and may be constructive or destructive.

Destructive:



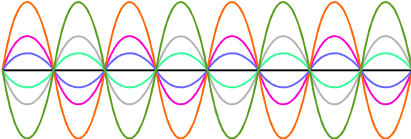
Interference

Regular patterns of interference can be produced by adding waves of the same wavelength and amplitude.



Interference

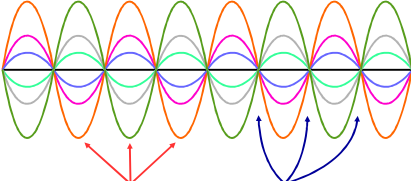
Regular patterns of interference can be produced by adding waves of the same wavelength and amplitude.



Each color represents a snapshot at a different moment in time.

Interference

Regular patterns of interference can be produced by adding waves of the same wavelength and amplitude.

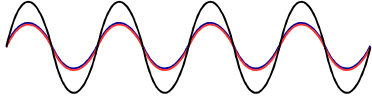


Maxima Minima

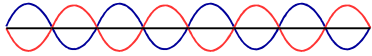
Interference

Consider two waves traveling in the same direction:

Waves in phase (Wave 1, Wave 2, Sum)



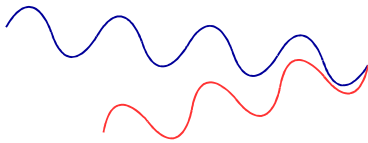
Waves out of phase by π (Wave 1, Wave 2, Sum)



Interference

For waves produced in phase, path difference must be an integer number of wavelengths for totally constructive interference.

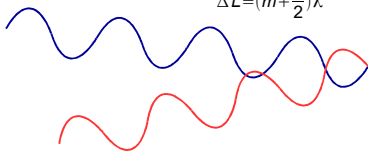
$$\Delta L = m\lambda$$

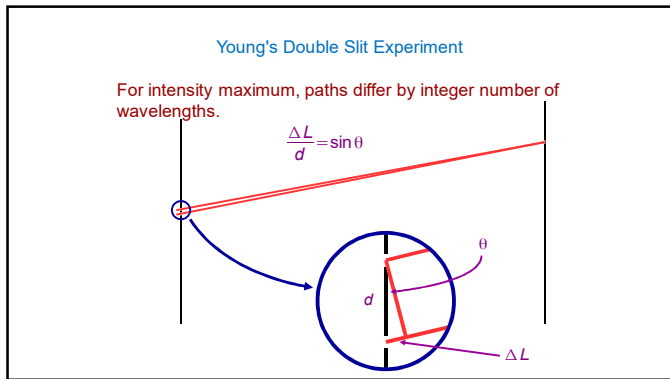


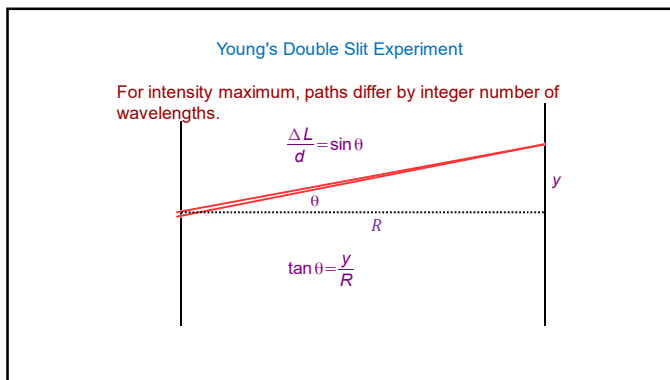
Interference

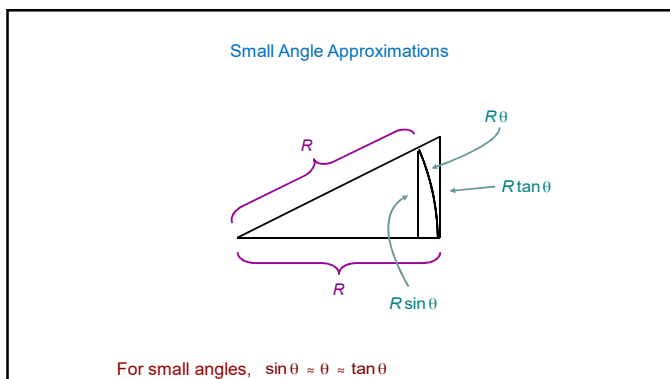
For waves produced in phase, path difference must be a half-integer number of wavelengths for totally destructive interference.

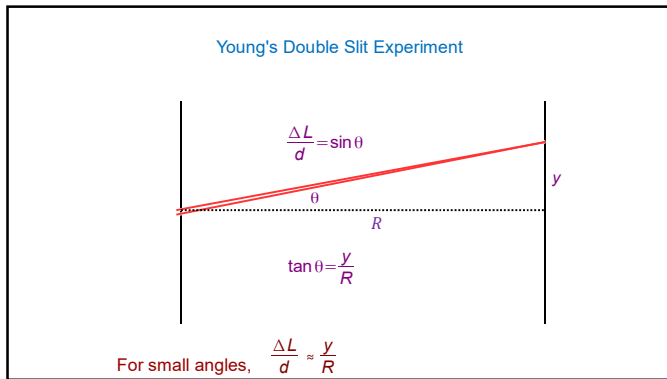
$$\Delta L = (m + \frac{1}{2})\lambda$$

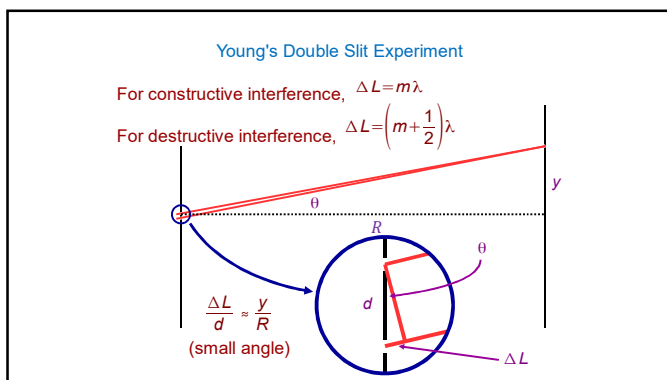


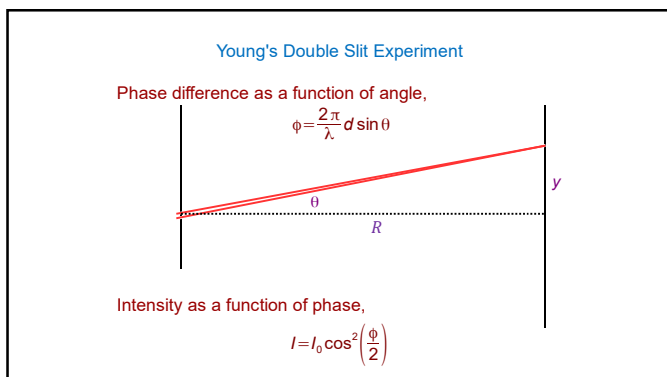


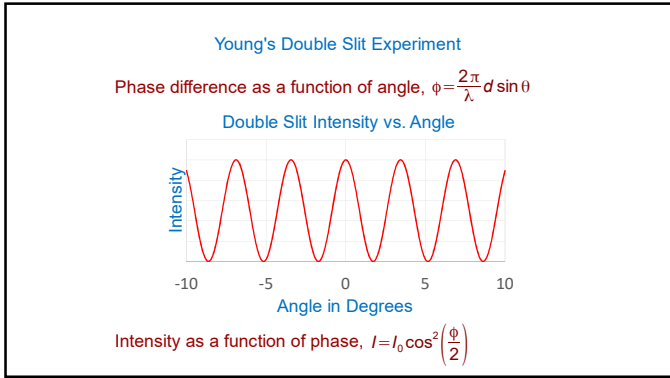












Example: a viewing screen is separated from the double-slit source by 1.2 m. The distance between the two slits is 0.030 mm. The second-order bright fringe ($m = 2$) is 4.5 cm from the center line. Determine the wavelength of the light.

Example: a viewing screen is separated from the double-slit source by 1.2 m. The distance between the two slits is 0.030 mm. The second-order bright fringe ($m = 2$) is 4.5 cm from the center line. Determine the distance between adjacent bright fringes.

Example: a viewing screen is separated from the double-slit source by 1.2 m. The distance between the two slits is 0.030 mm. The second-order bright fringe ($m = 2$) is 4.5 cm from the center line. Determine the width of the bright fringes.
