Two Source Interference Pattern

Apparatus

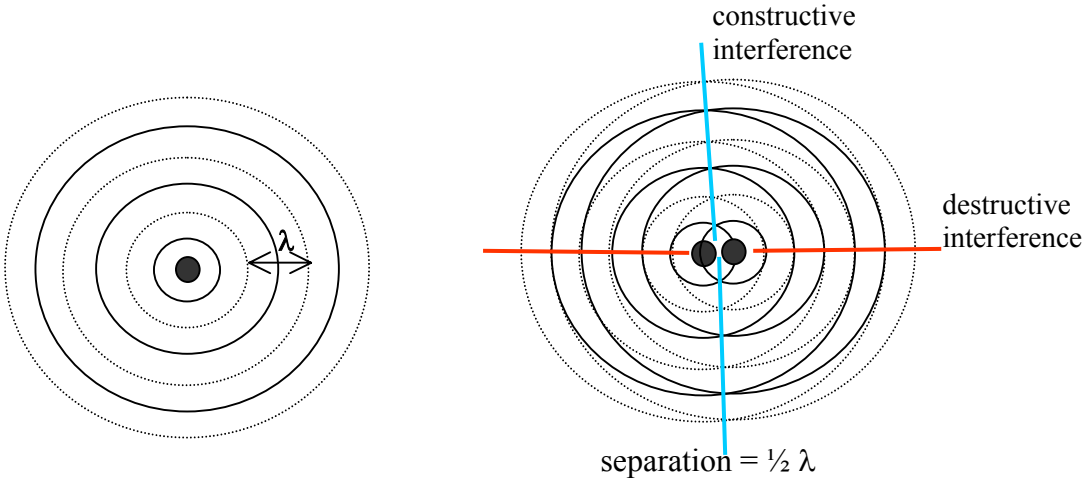
sheet of paper with concentric circles around central spot, alternating solid and dashed, overhead transparency sheet with identical set of concentric circles and spot, overhead (water soluble) markers

Action

The students sit the sheet of transparency over the paper. The dashed lines represent troughs and the solid lines represent peaks, around the source (dot) at a given moment in time. When the two sources are in the same position there is effectively only a single source. The students move the sources apart by sliding the transparency over the paper. They should be able to find points of maximum constructive interference and maximum destructive interference. The overhead markers can be used to mark in interference patterns for given source separations. They should find the source separation at which they first get nodal lines or lines of destructive interference, and when they first find antinodes, or constructive interference.

The Physics

For a trough from one source to meet a crest from the other requires a path difference of ½ λ between the two waves. Hence a nodal line first appears along the axis joining the two sources when the sources are ½ λ apart. At any separation smaller that this there are no lines along which troughs and crests meet to give destructive interference.



Accompanying sheet

Two Source Interference Pattern

Place the circular wave pattern on the transparency over the pattern on the paper so that the sources are at the same point.

Now move them apart until you first get nodal lines.

How far are the sources apart now (in multiples of λ)?
Why can't there be any nodal lines for smaller separations?