Two-Point Source Interference Patterns Simulation

Purpose: To determine the relationships between the path difference and the wavelength for both nodal and antinodal lines of a two-point source interference pattern.

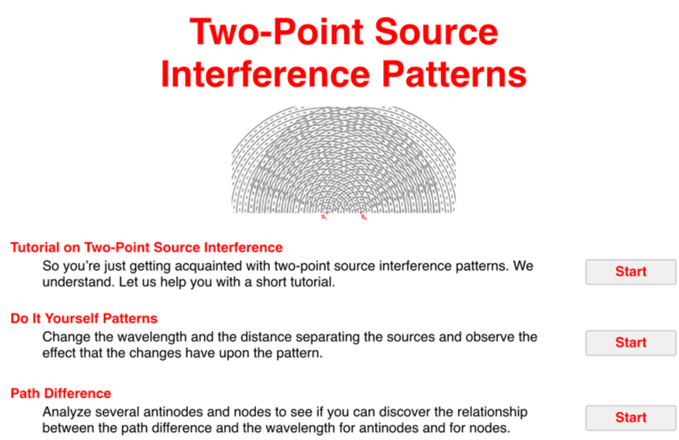
Getting Ready: Navigate to the **Two-Point Source Interference Patterns** found in the **Physics Interactives** section at **The Physics Classroom**.

https://www.physicsclassroom.com/Physics-Interactives/Light-and-Color/Interference-Patterns

Navigation:
www.physicsclassroom.com => Physics Interactives => Light and Color => Two-Point Source Interference Patterns

About this Activity

This interactive consists of three parts. This student activity provides guidance with each part. Answer questions as you proceed through the parts of the simulation.



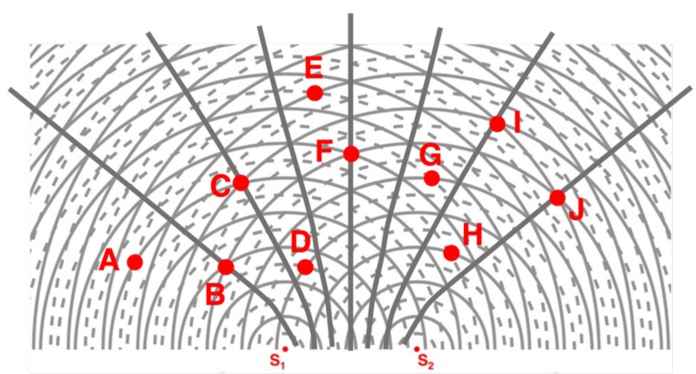
Part 1: Tutorial

From the Main Menu, tap on the Tutorial to begin a 1 screen tutorial.

1. Constructive interference occurs at the _____________ (nodes, antinodes).

   Destructive interference occurs at the _____________ (nodes, antinodes).

A two-point source interference pattern is shown in the diagram. There are 10 labeled points. Some are nodes; others are antinodes.



2. Points _____________ are antinodes.
3. Points _____________ are nodes.
4. On the diagram, write the names of each line.
5. A is on the _____ _____________ line.
   (first blank = number;
   second blank = nodal or antinodal)
6. C is on the _____ _____________ line.
7. G is on the _____ _____________ line.
8. J is on the _____ _____________ line.
9. The distance from S_1 to **B** is ______ λ. The distance from S_2 to **B** is ______ λ. The path difference is _______ λ. Point **B** is on the ______ antinodal line.
10. The distance from S_1 to **I** is _______ λ. The distance from S_2 to **I** is ______ λ. The path difference is _______ λ. Point **I** is on the ______ antinodal line.
11. The distance from S_1 to **D** is _______ λ. The distance from S_2 to **D** is ______ λ. The path difference is _______ λ. Point **D** is on the ________ nodal line.
12. The distance from S_1 to **H** is _______ λ. The distance from S_2 to **H** is ______ λ. The path difference is _______ λ. Point **H** is on the ______ nodal line.

Part 2: Do It Yourself Patterns

Open **Part 2** of the simulation. Use the up/down arrows to investigate the effect of varying wavelength and separation distance upon the pattern. Give specific attention to whether a change in an independent variable causes the antinodal lines to move closer together or further apart. Complete the following sentences with closer together or further apart.

13. Increasing the wavelength causes antinodal lines to move ____________________.
14. Decreasing the wavelength causes antinodal lines to move ____________________.
15. Increasing the separation distance causes the lines to move ____________________.
16. Decreasing the separation distance causes the lines to move ____________________.

Part 3: Path Difference

Open Part 3 of the simulation. Tap on four nodes and four antinodes to collect data for S_1P, S_2P, and PD. Complete the table. Express values in terms of wavelength.

Point P is	Line	S_1P	S_2P	PD

17. Investigate the relationship between path difference (PD) and wavelength for the antinodal and the nodal lines. Can you write an equation in the form of PD = …
that expresses this relationship? Once you make your claim, support it with evidence (references to your data table) and reasoning (explanations as to how the data support the claim).