Young’s Interference Experiment
The Young’s interference experiment was one of the well-known experiments that shows the wave nature of light. It is the fundamental of several quantum optics experiments nowadays. We reproduce this famous experiment in VirtualLab Fusion, by using a double slit with adjustable slit width and slit distance. With a single point source, we examine the influence from the slit width and the slit distance on the interference; then with an extended source we observe how the interference contrast changes with the lateral extension of the source.
Modeling Task – Single on-Axis Point Source

How does the pattern look like when vary the slit width and slit distance?
Fix Slit Distance (500µm) and Vary Slit Width

The slit width determines the divergence of the field passing through it – the wider the slit the smaller the divergence, and therefore a narrower envelope.
Fix Slit Width (100µm) and Vary Slit Distance

The slit distance determines the angles between the two interference beams. Larger slit distance leads to larger angle and therefore denser interference fringes.
Modeling Task – Single off-Axis Point Source

How does the pattern look like for an off-axis point source?

- lateral shift
- input field - point source - wavelength 589.3 nm
- circular aperture
- double slit
- circular aperture
- double slit
- 100 µm
- 500 µm
- 650 mm
Ray optics predicts that only one slit is illuminated. If that were true, there would be no interference.

Because of diffraction from the circular aperture, both slits can be illuminated and that will produce interference pattern, as shown in the field tracing result.
Modeling Task – Extended Source

- spatially extended source
- wavelength 589.3 nm

How does the pattern look like when increase aperture size?

- modeled by an array of laterally shifted point sources

input field

circular aperture

double slit

10 mm
500 mm
650 mm

aperture size

100 µm
500 µm
The interference contrast decreases when aperture size increases.
Peek into VirtualLab Fusion

Parameter Run for different off-axis point source

convenient settings for point source

result pattern
Workflow in VirtualLab Fusion

- Programming a double-slit function
  - Programming a Double-Slit Function [Use Case]

- Check influence from different parameters with Parameter Run
  - Usage of the Parameter Run Document [Use Case]
  - Scanning Mode of Parameter Run [Use Case]

- Model partially coherent source by shifted elementary-field method
## Young's Interference Experiment

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[White-Light Michelson Interferometer](#)

[Mach-Zehnder Interferometer](#)