



Young's double slit experiment



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Summary

Young's double slit experiment. (15/04/2023 new version support)

[Learning](#) > [Physics & Astronomy](#)

Equipment to reproduce Young's double slit experiment.

To obtain appreciable results, the separation of the slits must be in the order of 0.2 mm or thinner, beyond the possibility of FDM 3d printers that normally have a 0.4 mm nozzle resolution limit.

For this reason I decided to make a frame with a single slit, and use a thin metal wire to divide it in two.

We need a thin metal wire and two m3 screws to fix it to the frame.

Then we need a beam of light with a homogeneous wavelength, so we will use a laser.

Once the whole set is done, you will be able to see it projected on a wall or on a screen
the fringes of light interference.

https://en.wikipedia.org/wiki/Young's_interference_experiment

Wavelength measurement

From the size of the fringes, you can also derive the wavelength of the laser beam used.

Here is the setup I used:

For the laser source I used a hunting red laser sight, which has the advantage that the beam direction can be adjusted acting on the screws, but a laser pointer is also fine.

I took the thin wire from an electrical cable, which contains a myriad of thin copper wires with a diameter of 0.18 mm.

To make the correct calculations on the separation of the slits, the following consideration must be made:

P Q | | ----- | | | A B C D

AB is the space of the first slit

BC is the diameter of the wire separating the two slits

CD is the space of the second slit.

The right space between the slits to consider is not the diameter of the wire,

but it is instead the distance between the center of the first slit and the center of the second slit, i.e. PQ.

In practice with a 0.18mm wire the space between the slits is 0.36mm

For the size of the fringes, I measured the distance of the 3 most evident central fringes, and then I divided by 3: 16mm/3=5.33mm

I finally placed the device 3 meters from the screen (wall)

And here is the formula for calculating the wavelength:

wavelength = (fringe_spacing (m) x slit_separation (m)) / D (m)

D=3 m

slit_separation=0.36x10⁻³ m

fringe_spacing=5.33x10⁻³ m

(5.33 x 10⁻³ x 0.36 x 10⁻³) / 3 = 0.639 x 10⁻⁶ = 639 nm

result compatible with the wavelength of a red laser.

Model files



telaio.stl

☐ single slit with holes for thin wire mounting



supporto.stl

☐ 15/04/2023 new version support



schermo.stl

☐ the best double slit we can do with a FDM 3d printer 0.4 mm resolution



supporto_piccolo.stl

☐ a little extra support for long laser pointers

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