

DETERMINATION OF WAVELENGTH USING YOUNG'S DOUBLE SLITS

Specification reference: **AS Component** **2.5 – Wave properties**

A level Component **3.2 – Wave properties**

Theory:

The fringe spacing, Δy is given by the equation $\Delta y = \frac{\lambda D}{d}$ where λ is the wavelength of the light; D is the distance from the slits to the screen where the fringes are viewed and d is the distance between the slits. A graph of Δy against D should be a straight line and the gradient can be used to determine the wavelength of the light.

Apparatus:

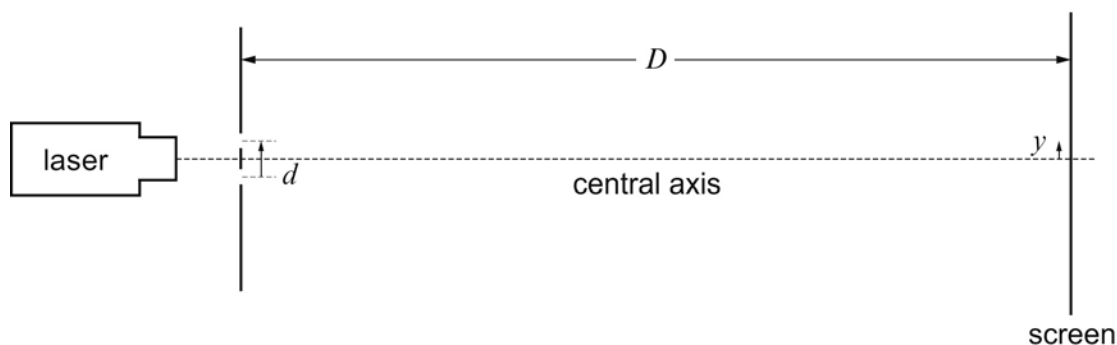
Laser pen
Stand and clamp
Double slit
Screen
Metre rule
30 cm ruler or digital callipers

Further Guidance for Technicians:

The value of d can be given to students when using the apparatus. The experiment can be undertaken in the main laboratory and does not require dark room facilities.

Experimental Method:

The apparatus should be set-up as follows:



Measure the fringe spacing Δy , the spacing between the double slits, d , and the distance, D , from the slits to the screen using either the ruler or digital callipers. Vary the distance, D in equal intervals. Plot a graph of the fringe spacing Δy (y -axis) against the slit-screen distance D (x -axis). This should be a straight line through the origin.

If the fringes are close together; Δy can be determined by measuring the separation of a number of fringes. So determine Δy by dividing the distance by the number of fringes measured.

Extension:

Microwaves could be used instead of light with 3 metal plates used to create a double slit arrangement. A transmitter and a suitable receiver could be used with an analogue measuring instrument to show the intensity variations corresponding to the fringes.

Practical Techniques:

- Use appropriate analogue apparatus to record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings.
- Use laser or light source to investigate characteristics of light, including interference and diffraction.