DETERMINATION OF WAVELENGTH USING YOUNG'S DOUBLE SLITS

Specification reference: **AS Unit 2.5 – 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.
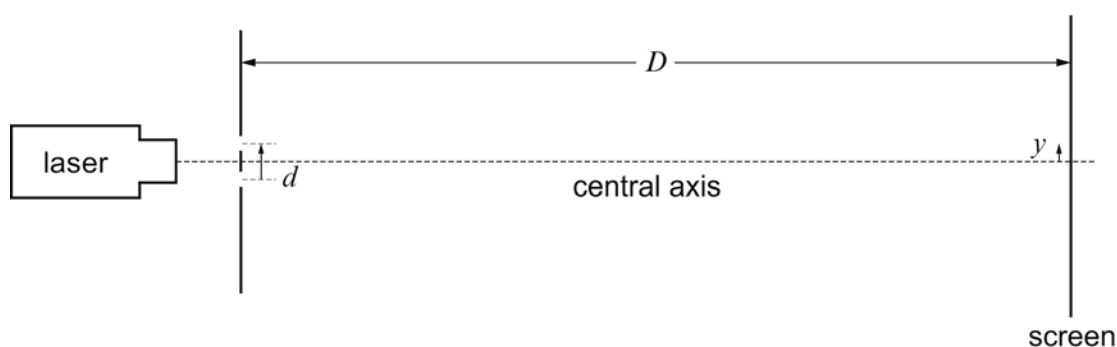
Apparatus:

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.