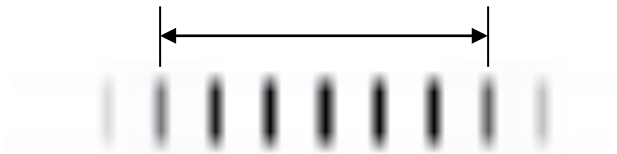
3rd March

1. A student is carrying out a practical using Young's slits and a laser. They are using six different distances between the double slits and the screen where the fringe pattern is observed.

   They measure the distance, as shown on the diagram, for each set of fringes observed using a vernier caliper.



   a. Explain the **advantage** of measuring the distance shown above, rather than from one bright fringe to the next

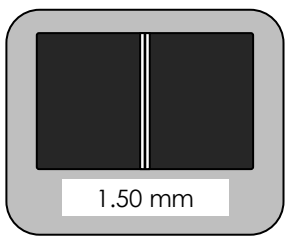
   b. **Complete** the table and **plot** this on the graph opposite

Slit to screen distance / m	Distance measured / mm	Fringe spacing / mm
0.50	1.14	0.190
1.00	2.36	
1.50	3.72	
2.00	4.74	
2.50	6.02	
3.00	7.32	

   c. The separation of the slits used was 1.50 mm. Use this information, and the **gradient** of your graph, to calculate a value for the **wavelength** of the laser light used

3rd March

Fringe spacing / mm

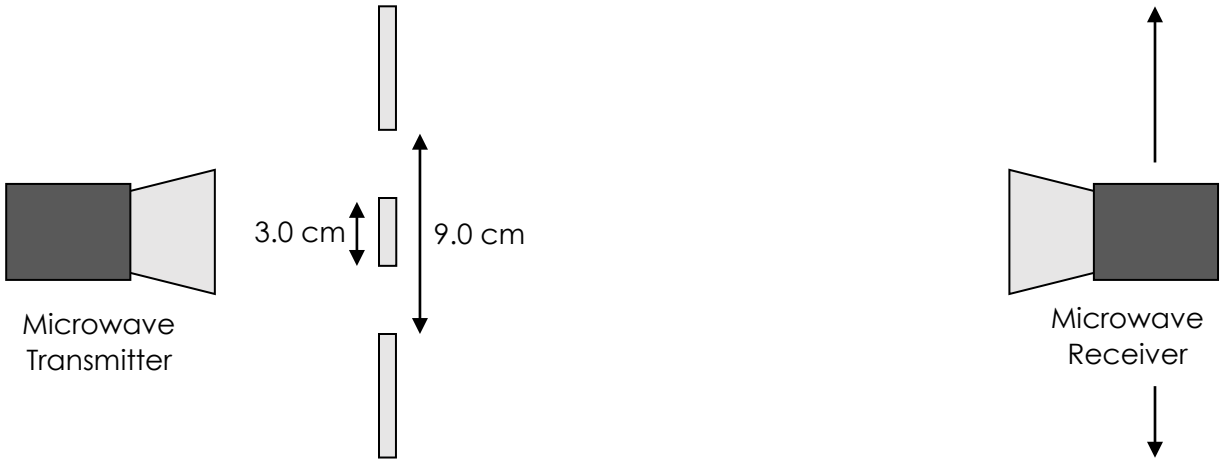


0 0.5 1.0 1.5 2.0 2.5 3.0

Distance to screen / m

4th March – Part 1

1. A teacher is demonstrating interference using a microwave transmitter and receiver with metal sheets arranged to form a double slit system. The central 3.0 cm wide metal sheet is in the middle of the gap formed by the wider outer metal sheets. The microwave detector can be moved in either direction along a line drawn parallel to the slits and 1.0 m away from the slits, as shown in the plan view.



a. Determine the **distance** between the **centres** of the two slits formed in the experimental set-up above

b. The transmitter is set to 10 GHz. Calculate the **wavelength** of the microwaves

c. Coherent sources of waves are needed to form a clear interference pattern. **Define** what we mean by '**coherent**'

d. State the **path** difference and **phase** difference for the maximum constructive interference to occur:

   i. Path difference

   ii. Phase difference

4th March – Part 2

The receiver is initially positioned to detect the central maxima opposite the transmitter and detects a maximum signal strength. If it is moved along the line away from the centre, the signal strength decreases then increases to a maximum.

e. Calculate the **distance** to this first maximum from the initial position

When the receiver is moved along the line away from the centre it detects a second and then a third position where the signal strength is a maximum.

f. Calculate the **angles** where these two maxima are detected

   i. Second

   ii. Third