



### QUICK START TUTORIAL CREATING A PROJECT STEP-BY-STEP

Welcome! We assume that you have successfully installed Pintar **VirtualLab™** Waves on your computer. You are now ready to use this fantastic tool to explore the wonderful world of waves.

In this tutorial, we shall do a couple of small projects. For a novice user, the quickest way to become familiar with Pintar **VirtualLab™** Waves is to follow this step-by-step tutorial. Throughout this tutorial, you will find quick references to the detail description, as indicated by the (?) symbol.

This tutorial also assumes that you possess a working knowledge of Windows 9x, NT, 2000, Me and XP. Certain words used to describe operations in this tutorial have specific meaning.

Click	Press once on the mouse button.
Double-click	Press twice on the mouse button in quick succession.
Select	Click once on a specific object.
Drag	Press the mouse button and drag, holding the mouse button down as you do so. Let go to the mouse at the intended location.
Type	Press on a specific key on the keyboard.
Choose	Select a menu item.

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#### Launching Pintar VirtualLab™ Waves

We assume that you have successfully installed the Pintar **VirtualLab™** Waves. In the Waves folder, double-click on the icon labelled WAVE.EXE.

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## TUTORIAL

In this tutorial, we shall be performing two simple experiments to study the different aspects of two-dimensional waves.

### EXPERIMENT 1

#### OBJECTIVE:

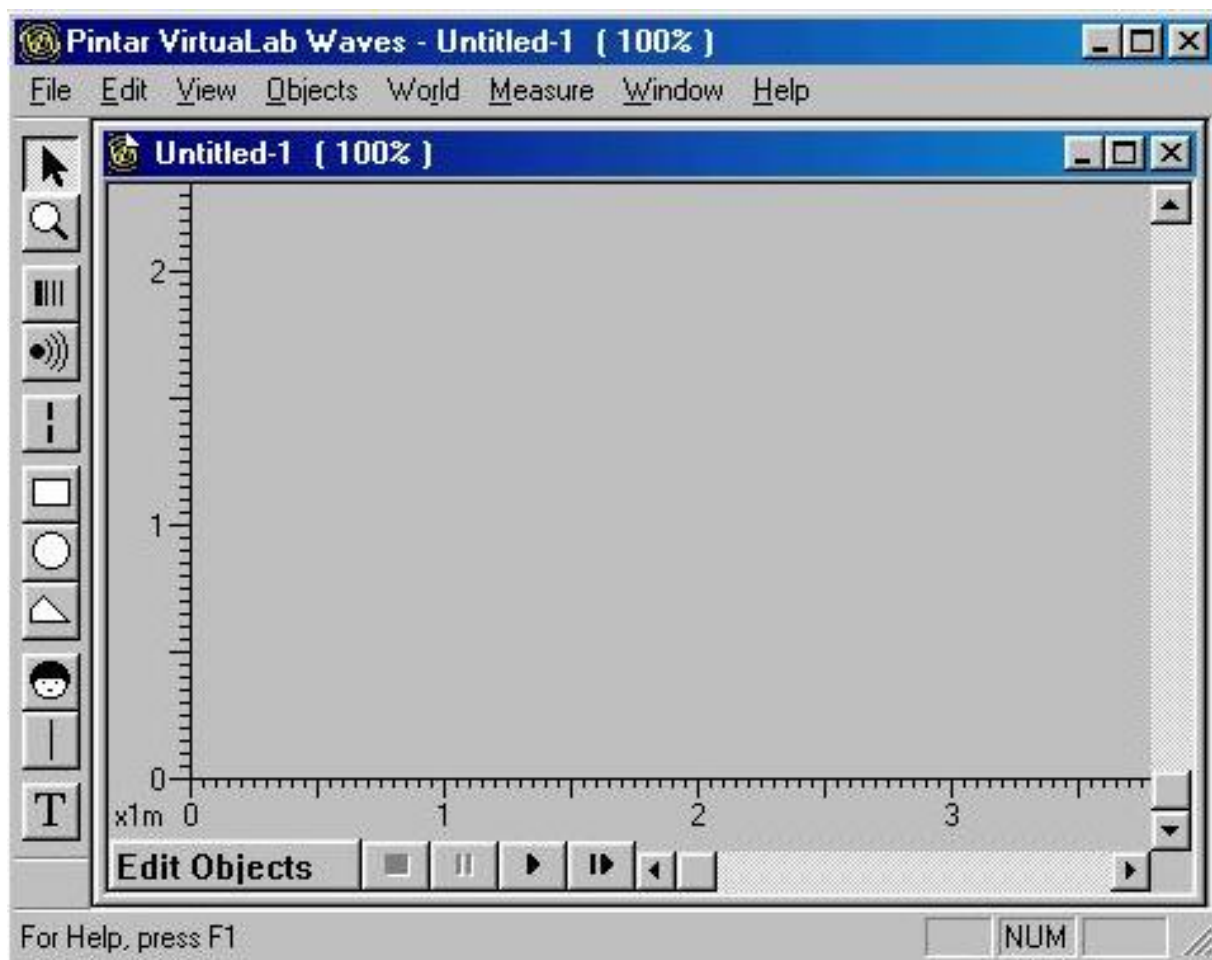
To observe the interference caused by two spherical (circular) waves.

#### PROCEDURE:


##### 1. Starting a new project.

a) Select 'New' from the File menu. A blank Workbench labelled "Untitled-1" is created.

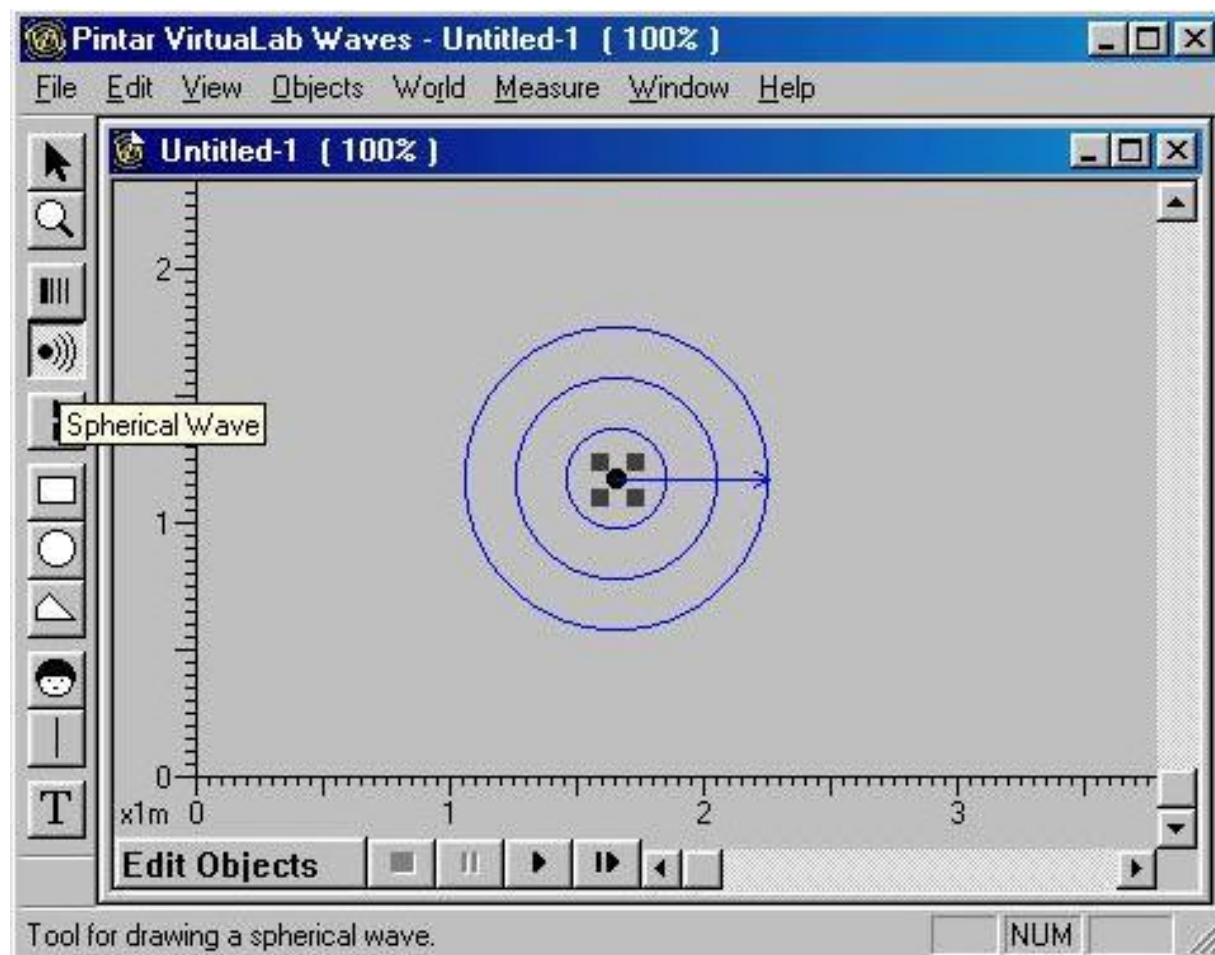
? • [Starting a new experiment](#)



## 2. To draw a spherical wave source on the Workbench.

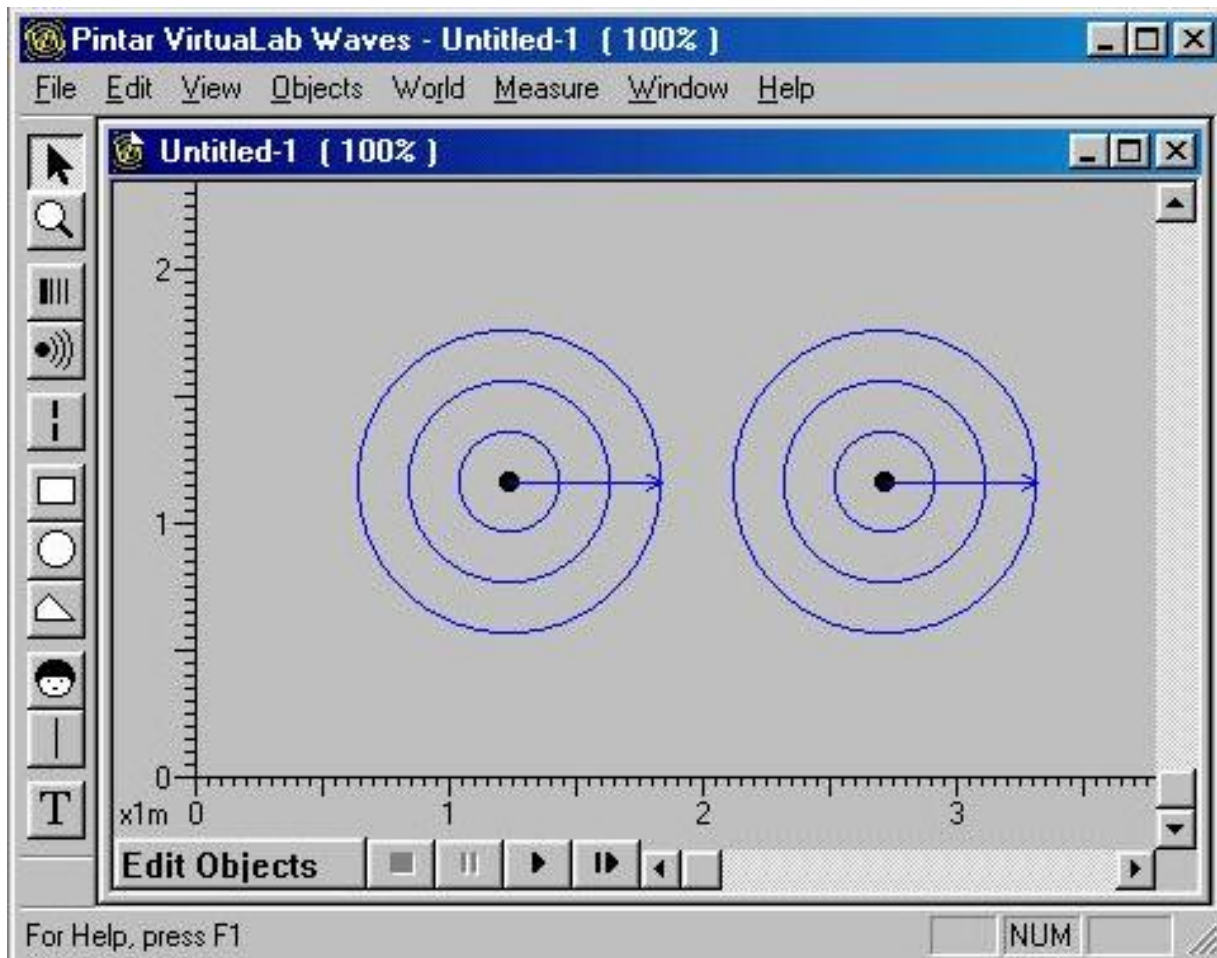
- Choose the Spherical Wave tool  from the Toolbar. The cursor changes to a cross-hair.
- Move the cursor to the boxed area of the Workbench. Click within the box. A wave source is placed at where you clicked.

Note: This box demarcates the active area of the Workbench. Objects placed outside of this box do not become part of the experiment. The Wave engine is computationally very intensive. To have an active area the size of the entire Workbench would too long to compute before displaying the simulation.



- Repeat steps (a) and (b) to draw another wave source on the Workbench.

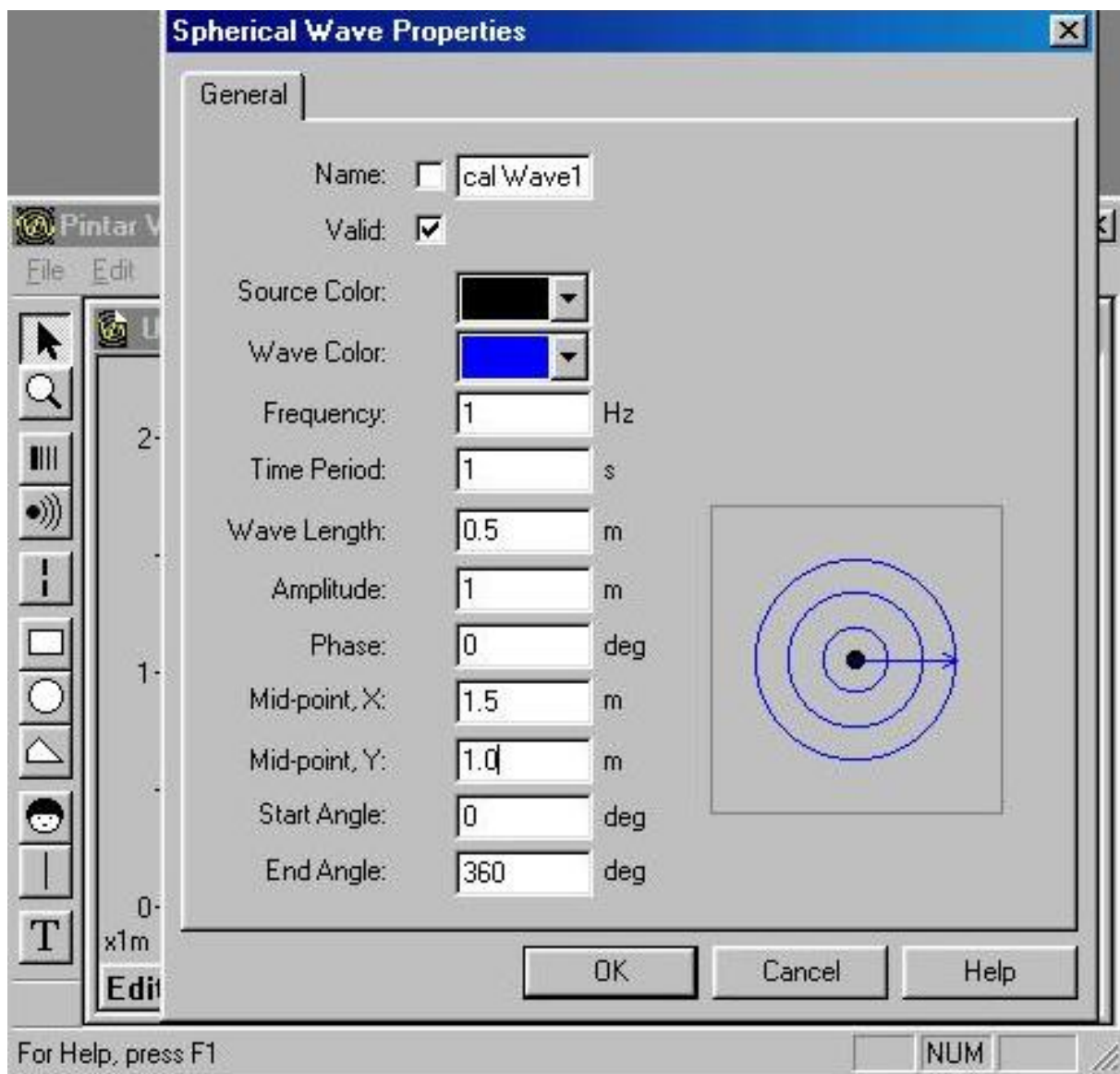
? • [About spherical waves](#)



### 3. Editing the setup of the experiment.

We want to adjust the setup of the experiment such that the positions of the wave sources are suitable for the experiment. To do this all we need to do is to set the parameters of the wave sources.

- a) Double-click on one of the wave sources. A Spherical Wave Properties dialog appears. Specify the parameters in the dialog according to the table below.



b) Do the same for the second wave source.

Valid	Check	Check
Frequency	1 Hz	1 Hz
Time Period	1s	1s
Wave Length	0.5m	0.5m
Amplitude	1m	1m
Phase	0 deg	0 deg
Mid-point, X	1.5 m	3.5 m
Mid-point, Y	1.0 m	1.0 m
Start Angle	0 deg	0 deg
End Angle	360 deg	360 deg

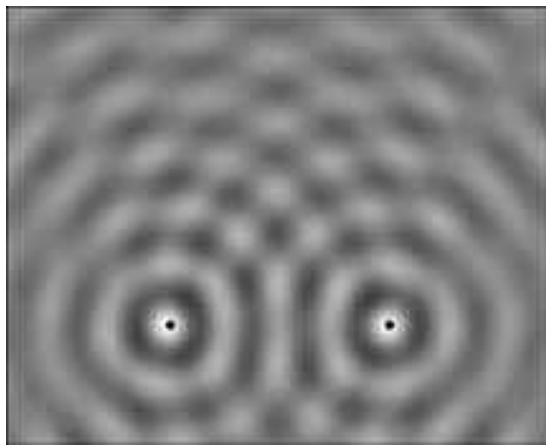
? • [To move a spherical wave source](#)

#### 4. Run your experiment.

You are now ready to give your experiment a trial run. Click on the Run button in the Control Panel. A dialog with a progress bar appears.

Note: As explained above, Waves Workbench is computationally very intensive, and may take up to a minute (depending on the speed of your computer) to process before displaying the simulation.

When the computation is complete, the dialog closes and the resulting wave is displayed on the Workbench.




#### 5. Stop your experiment.

After you have view your experiment running for some time, stop your experiment by clicking on the Stop button in the Control Panel.

#### 6. Annotating your experiment

If you are quite satisfied with your experiment, you may wish to share it with your classmates. However, you may want to add some text to annotate your experiment, so that your experiment can be better understood.

- a) Select the Text tool . The cursor changes to a cross-hair.
- b) Move the cursor to the Workbench and click to set where you want the type to be. A 'text' object appears at where you clicked.
- c) Double-click on the text object. A Text dialog appears.
- d) Click inside the text area and enter, "Experiment To Study Wave Interference."

e) Set the text alignment to 'Center'.

f) Next, click on the Choose Font button. The Font properties dialog opens. Set the font attributes to:

<b>Font:</b>	<b>Arial</b>
<b>Font style:</b>	<b>Regular</b>
<b>Size:</b>	<b>24 points</b>
<b>Effect:</b>	<b>Underline</b>
<b>Color:</b>	<b>Black</b>

g) Click OK. Your text will appear on the Workbench where you clicked.

h) Click and drag the text object to make fine adjustments with regards to the position of the text on the Workbench.

i) By following the same steps described here, add another text object to your experiment that reads, "Interference is caused by the superimposition of two waves. Where the two waves are superposed in the same phase, we get constructive interference."

## **7. Save your experiment.**

Save your project by choosing Save As... from the File menu. Give an appropriate name to your experiment.

? • [Save](#)

? • [Save As...](#)

## **8. Ending your work session.**

Finally, when you are ready to call it a day, select Quit from the File menu.

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## **EXPERIMENT 2**

### **OBJECTIVE:**

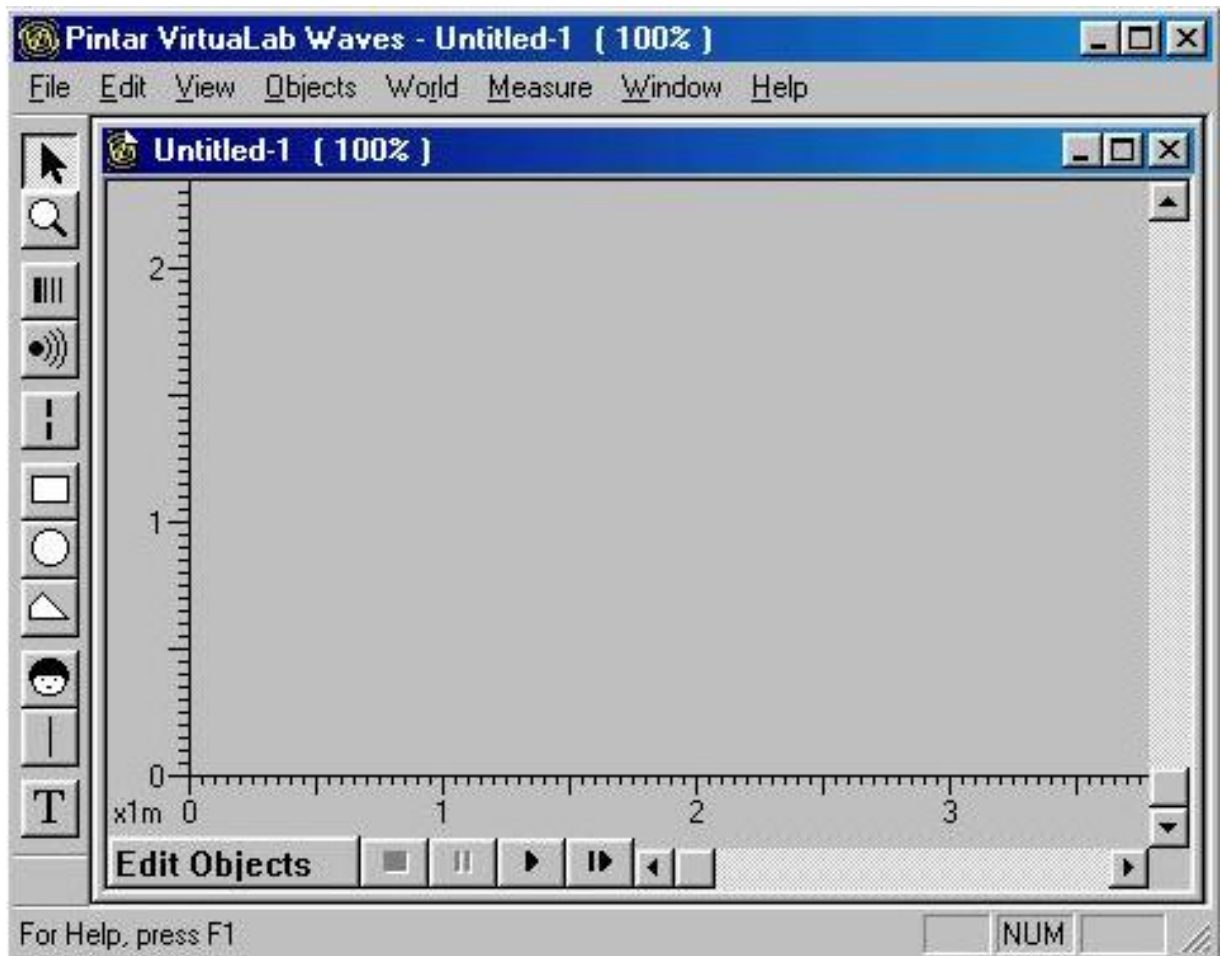
To observe the phenomenon of diffraction in a two dimensional wave.

### **PROCEDURE:**


#### **1. Starting a new project.**

a) Select 'New' from the File menu. A blank Workbench labelled "Untitled-1" is created.



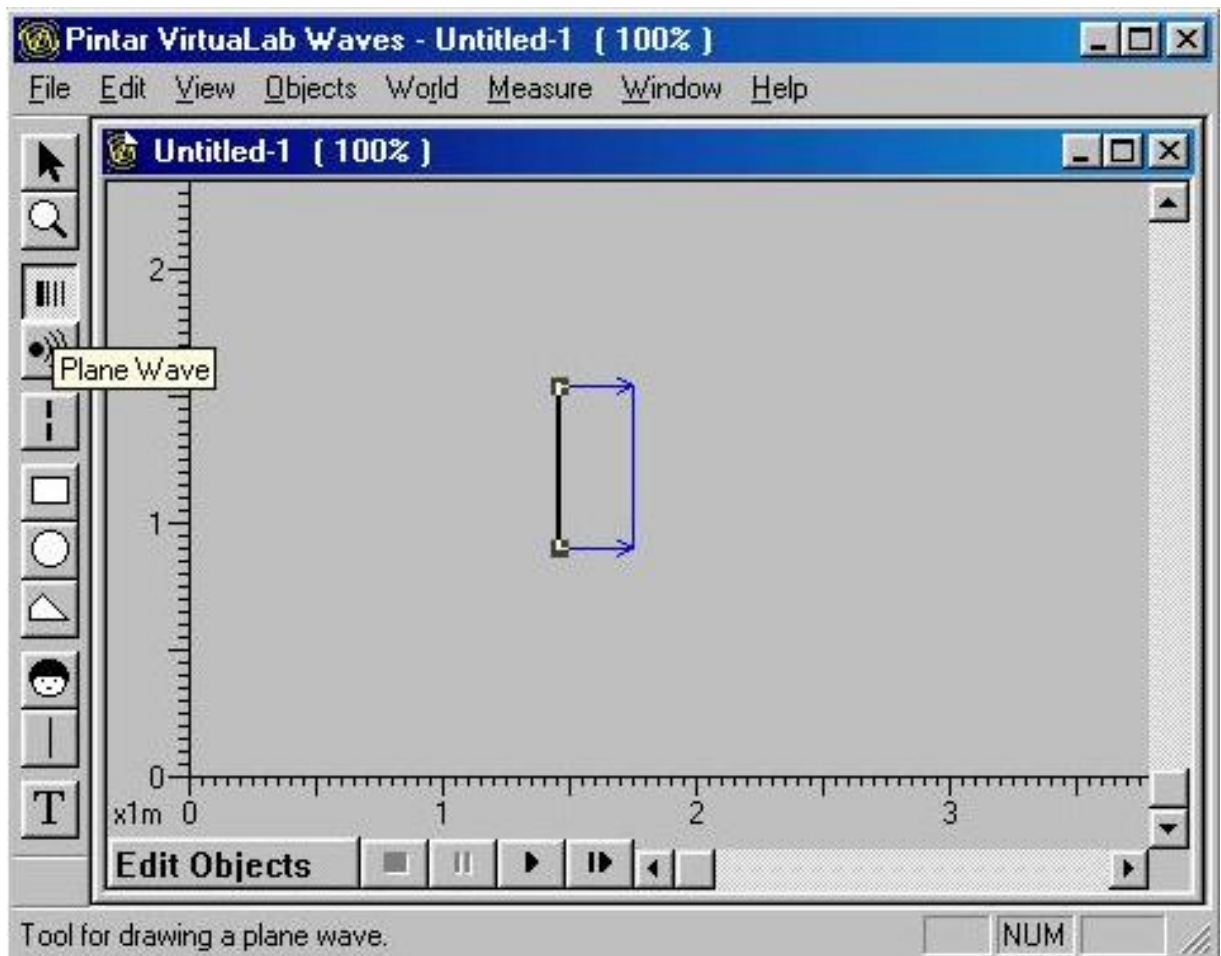


## 2. To draw a plane wave source on the Workbench


- Choose the Plane Wave tool  from the Toolbar. The cursor changes to a cross-hair.
- Move the cursor to the boxed area of the Workbench. Click within the box, and drag downwards. As you drag the cursor, a line extends from the point where you clicked to the cursor.
- At the end of the plane wave, release the mouse button. A plane wave source, with arrows pointing in the direction of wave propagation, is drawn on the Workbench.

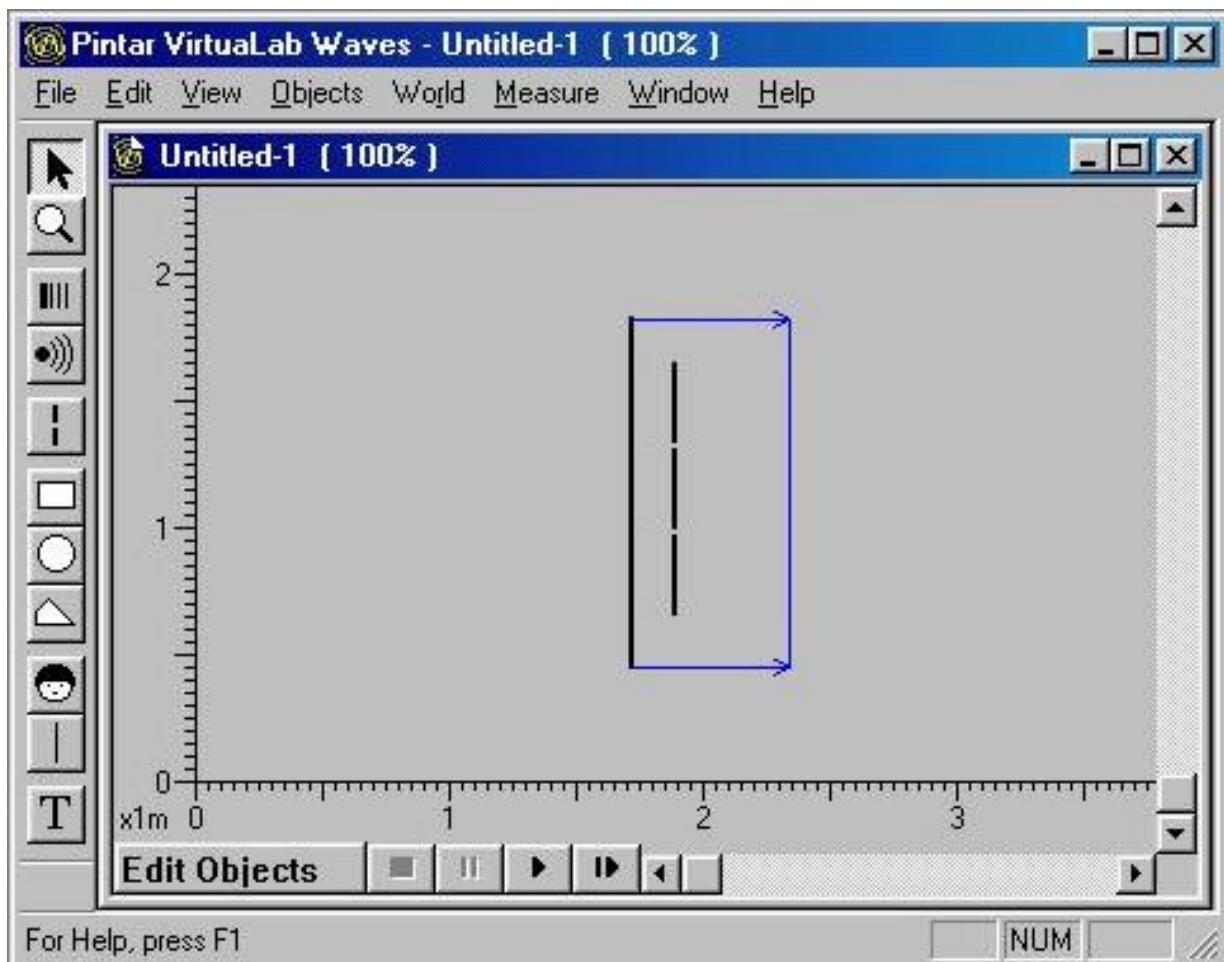
? • [About plane waves](#)





**3. To draw a slit barrier on the Workbench.**

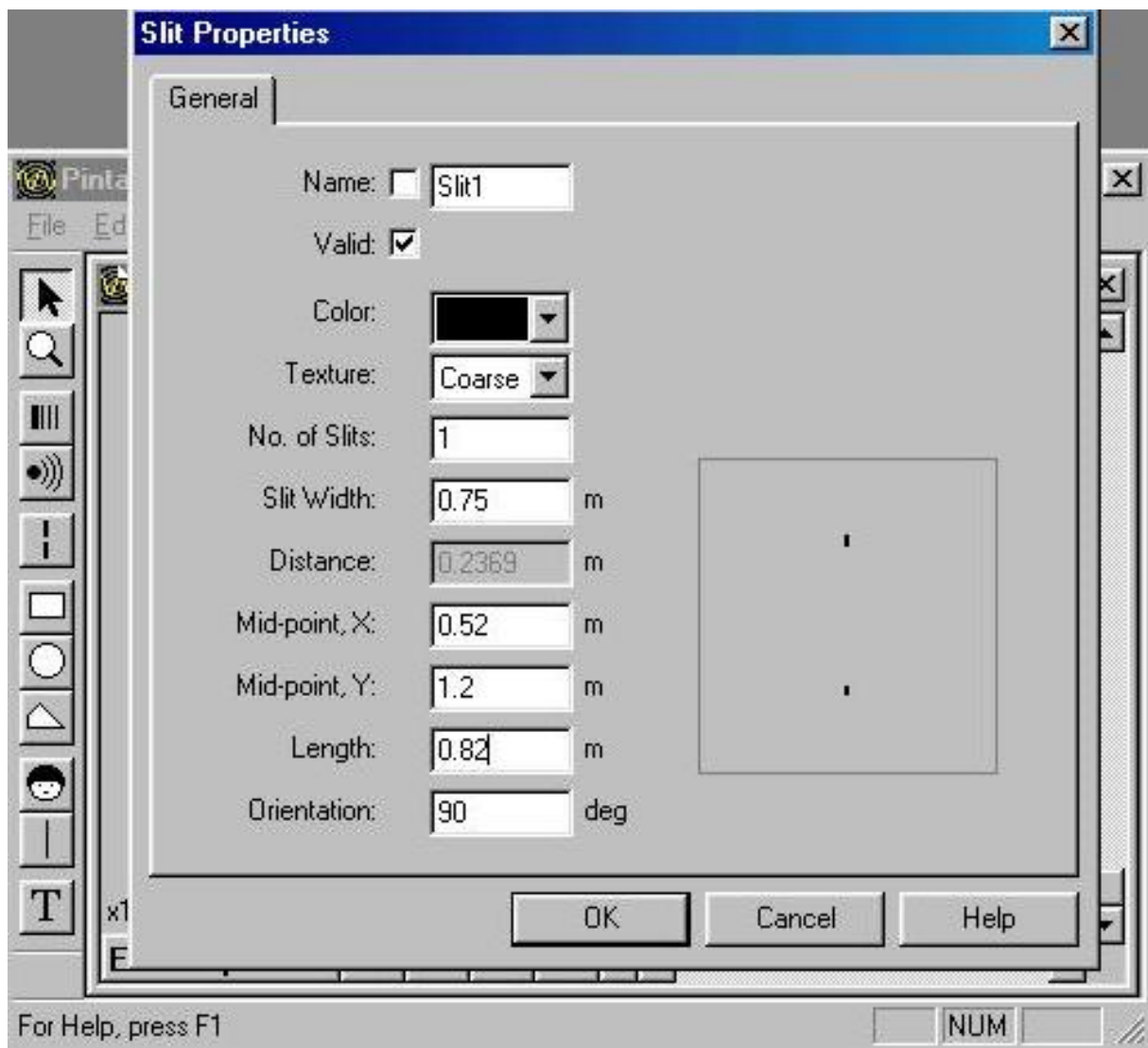
- Choose the Slits tool  in the Toolbar. The cursor changes to a cross-hair.
- In the same manner as you drew the plane wave source above, draw a vertical slits barrier.



#### 4. Editing the setup of the experiment.

We want to adjust the setup of the experiment such that the positions of the wave sources are suitable for the experiment.

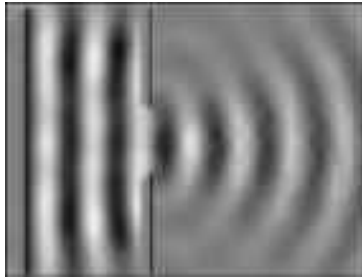
- Make sure that both the plane wave source and the slits barrier are vertical. To make them vertical, select the object, and drag on the handles.
- The plane wave source is at the left edge of the simulation box. The slits barrier should be about one-and-a-quarter meters to the right from the plane wave source.
- Double-click on the slits barrier. A Slits Properties dialog appears. Change the number of slits to one, and the width of the slit to 0.75 m. The texture should be set to 'coarse'.



- ? • [To move a plane wave source](#)
- ? • [To examine or specify the properties of a plane wave](#)
- ? • [To move a slits component](#)
- ? • [To examine or specify the properties of a slits component](#)

### **5. Run your experiment.**

You can now give your experiment a trial run. Click on the Run button in the Control Panel. A dialog indicating the progress of computation appears. When the computation is complete, the dialog closes and the resulting wave is displayed on the Workbench.



### **6. Stop your experiment.**

When you are satisfied with your experiment, stop your experiment.

### **7. Annotating your experiment**

As in Experiment 1, annotate your experiment a title and a brief explanation.

### **8. Save your experiment.**

Save your project.

### **9. Ending your work session.**

Finally, select Quit from the File menu.

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