

Lascells Free Experiments – Waves

The aim of this investigation is to measure the frequency, wavelength and wave speed using a ripple tank.

Frequency, f , wavelength λ and wave speed, v , are linked through the following equation:

$$f = \frac{v}{\lambda}$$

An approximation for the speed of waves in shallow water ($v_{shallow}$) can be given by:

$$v_{shallow} \approx \sqrt{gh}$$

where g is the acceleration due to gravity (9.81 ms^{-2}), and h is the depth of the water.

This approximation holds for when the wavelength is much greater than the water depth, and when wave amplitude is much less than the water depth. Both assumptions are valid for the ripple tank.

Equipment

- LA50-600 Lascells Ripple Tank MkIII PY3099
- LA50-610 Frequency Counter for Ripple Tank
- Steel ruler
- Millimetre scale printed on acetate sheet.



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Method

1. Place the ripple tank on a level bench and connect the power supply lead to the side socket. Plug the power unit into a mains supply and switch on.
2. Set the wave generator and strobe switches to OFF.
3. Lift the hinged lid to gain access to the wave generator.
4. Half fill the tank with clean water. Measure the depth of the water using a steel rule or the depth gauge on Vernier calipers. This is your measurement of h . Make a note of this value in m.
5. Install the plane wave dipper on the generator stem and adjust until the dipper just touches the surface of the water.
6. Switch on the waves and strobe and adjust as required.
7. Lay the millimeter scale inside the tank tray on the left-hand side - this will align it with the wall of the tray.
8. Switch the strobe to sync to synchronise the wave generator with the strobe light.
9. Using the scale, measure the wavelength of the water waves. One wavelength can be measured from the middle of a dark section to middle of the next dark section. It may be useful to measure over multiple wavelengths and divide by the number of waves in your sample - this will make your measurement more accurate. Make a note of your measurement for λ , and convert from mm to m by dividing by a factor of 1000.
10. Plug your value for h into Equation 19 to determine your wave speed, v .
11. Use your values for v and λ to sub into Equation 18 to determine your wave frequency, f .
12. Your calculated value for f can be checked using the Lascells Frequency Counter: turn the Frequency Counter on, and place on top of the ripple tank lid. The measured frequency will be displayed on the counter in Hertz.

The suitability of this experiment for a particular learning activity is up to the end user to assess based on their knowledge of the participants and the equipment, resources and safety standards available. While every experiment has been tested, by undertaking the activity, the end user accepts any and all risk. It is recommended that a risk assessment be conducted prior to any experimental activity being undertaken.