



Fluid Mechanics 2 (SCEE08003) laboratory briefing note

Guidance on plotting effective graphs

A graph is a powerful tool for use at all stages of work: from initial explorations of predicted or measured behaviour, through data gathering and checking; detailed analysis; comparisons of experiment and theory; and communication of all these. It may sound like a cliché, but a good graph really can tell 1000 words in a technical report.

A graph is part of a wider communication of results and their analysis. It is essential to work hard to make this communication as effective as possible. Conventions have emerged in effective graph plotting. It will reward you to become familiar with these. Follow them as far as possible, and understand situations when you might wish to (very thoughtfully / carefully) move away from a convention to make the communication even clearer.

The following are mostly common sense, but will help you plot good graphs.

- ✓ Plot the graph the right way around. “y against x” means y on the vertical axis and x on the horizontal axis. By convention, *i.e.* unless there is a very good reason to do otherwise, the x axis is the *independent variable* that is controlled (*e.g.* by you in an experiment) and y is the *dependent parameter* that depends upon x.
- ✓ Use scales that are easy to read. Avoid too many “0”s in the numbers.
- ✓ Label the axes with “*label in words, symbol (units)*” *e.g.* “*pressure in pipe, p (Pa)*”.
- ✓ Experimental points are shown as discrete symbols, or “markers” (*e.g.* crosses, squares, circles), and usually without lines joining them.
- ✓ Theoretical predictions, or ‘best-fit’ curves are represented by continuous curves with no markers.
- ✓ If you have estimated the error in your results, add error bars.
- ✓ If more than one data set needs to be shown on the same graph, use different symbols (circles, squares or triangles) and line styles (solid, dashed or dotted), and add a clear legend to distinguish these.
- ✓ Plot to a true zero wherever possible. If a break in an axis is necessary, make sure this is clearly marked.
- ✓ Choose x-axis to give a straight line graph where possible. *E.g.* if you expect a relationship $\text{force} \propto (\text{speed})^2$, then it is much better to plot F vs $(\text{speed})^2$ than simply F vs speed. This way, you expect to get a straight line relationship between y and x, which is much easier to confirm (or disprove) visually and analytically.
- ✓ If including the graph in a report, give it a figure number and caption, to help the reader find the figure in your report. In this case, you would usually NOT have a graph title, because this information will be in the figure caption text.
- ✗ Don’t rely on different colours, as these would be lost if your report is photocopied. Some readers might also struggle to distinguish certain colours.