Numerical modelling of physical systems

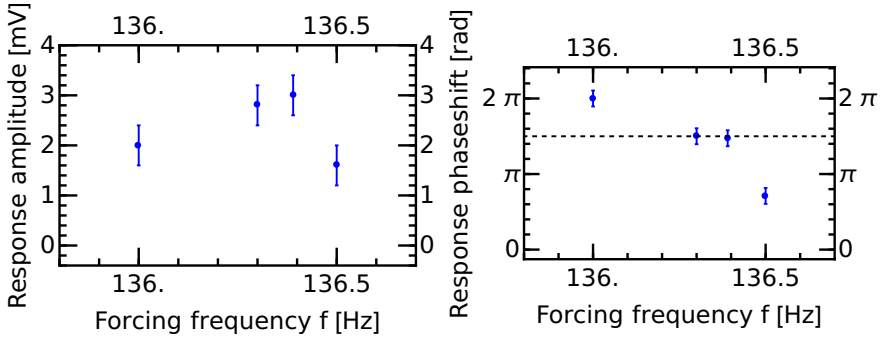
Pawel Czyz

St. Hugh's College, University of Oxford,
Margaret Road, Oxford OX2 6LE, UK
pawel.czyz@st-hughs.ox.ac.uk

Abstract. We present a new Python library enabling scientist to write accurate and effective numerical simulations. We investigate it's accuracy in a range of physical models, as Lorentz attractor and quantum harmonic oscillator.

Keywords: numerical modelling, Runge-Kutta, Numerov, chaos

Fig. 1: Mock - just a template how to insert images.



(a) (b)

Fig. 2: Figure 2a presents response amplitude as a function of frequency. Figure 2b presents the phase-shift, dashed line denotes value $3\pi/4$ (value when the phase-shift is a quater of the whole period). Both figures show that the resonance frequency can be estimated as 136.4(1) Hz.

References

1. *Gp03 lab script*, Department of Physics, Oxford University.
2. A. P. French, *Vibrations and waves*, CRC Press, 1971.
3. T. L. I. Bahar, *Normal mode analysis of biomolecular structures: Functional mechanisms of membrane proteins*, Chemical reviews, 110(3) (2010), pp. 1463–1497.
4. J. Lagnese, *Decay of solutions of wave equations in a bounded region with boundary dissipation*, Journal of Differential Equations, 50 (1983), pp. 163 – 182.
5. C. Torre, *General solution of the one-dimensional wave equation*, Foundations of Wave Phenomena, 16 (2014).