

On the error behaviour of exponential operator splitting methods for nonlinear Schrödinger equations

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In this talk, I will study the error behaviour of exponential operator splitting methods for nonlinear Schrödinger equations. In particular, I will focus on a second-order Strang type splitting scheme for the time integration of the Gross–Pitaevskii equation

$$i \hbar \partial_t \Psi(x, t) = \left(-\frac{\hbar^2}{2m} \Delta + U(x) + \frac{4\pi\hbar^2 a N}{m} |\Psi(x, t)|^2 \right) \Psi(x, t), \quad x \in \mathbb{R}^d, \quad t \geq 0,$$

describing Bose–Einstein condensates. The theoretical result will be illustrated by numerical examples.