Low regularity Fourier integrators for nonlinear Schrödinger equations

Abstract: Numerical schemes for semilinear Schrödinger equations, especially those of type

\[ i \partial_t u = -\Delta u + \mu |u|^{2p} u, \quad p \in \mathbb{N} \]

are nowadays extensively studied. This presentation gives a short introduction to the newly developed low-regularity exponential-type integrator by A. Ostermann and K. Schratz. In contrast to classical numerical schemes for the nonlinear Schrödinger equation, this integrator only requires the boundedness of one additional derivative of the solution for first-order convergence. We will firstly introduce splitting schemes for the cubic nonlinear Schrödinger equation, consider their failure for low regular initial functions and subsequently develop the new exponential-type integrator. I will furthermore present a recent idea of us how to extend this approach to a second-order Fourier integrator.