# Nonlinear Fourier integrators for dispersive equations

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A large toolbox of numerical schemes for dispersive equations has been established, based on different discretization techniques such as discretizing the variation-of-constants formula (e.g., exponential integrators) or splitting the full equation into a series of simpler subproblems (e.g., splitting methods). In many situations these classical schemes allow a precise and efficient approximation. This, however, drastically changes whenever non-smooth phenomena enter the scene such as for problems at low-regularity and high oscillations. Classical schemes fail to capture the oscillatory parts within the solution which leads to severe instabilities and loss of convergence. In this talk I present a new class of nonlinear Fourier integrators. The key idea in the construction of the new schemes is to tackle and deeply embed the underlying structure of resonances into the numerical discretization.? As in the continuous case, these terms are central to structure preservation and offer the new schemes strong geometric structure at low regularity.