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Global wellposedness and soliton resolution for the derivative nonlinear Schrödinger equation

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This talk concerns the Derivative Nonlinear Schrödinger (DNLS) equation that arises as a long-wave, weakly nonlinear model in the context of Hall magnetohydrodynamic equations. It was known since the work of Hayashi (1992) that solutions exist globally in time for small initial data in L 2 but the case of large data remained unknown. Exploiting the complete integrability of the DNLS equation, we prove global wellposedness for general initial conditions in weighted Sobolev spaces. Furthermore, for initial conditions that support bright solitons (but exclude spectral singularities), we give a full description of the long-time behavior of the solutions in the form of a finite sum of localized solitons and a dispersive component. Our analysis provides explicit formulae for the multi-soliton component as well as the correction dispersive term.

This is a joint work with Robert Jenkins, Jiaqi Liu and Peter Perry.

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