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Invariant Tori of Full Dimension for a Nonlinear Schrödinger Equation

In this talk, we consider the one-dimensional nonlinear Schrödinger equation

$$iu_t - u_{xx} + mu + f(|u|^2)u = 0$$

with periodic boundary conditions or Dirichlet boundary conditions, where f is a real analytic function in some neighborhood of the origin satisfying $f(0) = 0$, $f'(0) \neq 0$. We prove that for each given constant potential m , the equation admits a Whitney smooth family of small-amplitude, time almost-periodic solutions with all frequencies. The proof is based on a Birkhoff normal form reduction and an improved version of the KAM theorem. Thus, we give an affirmative answer to an open problem stated in Pöschel (Ergodic Theory Dynam. Systems **22**(2002), 1537–1549) and Bourgain (J. Funct. Anal. **229**(2005), 62–94).