Contribution ID: **46** Type: **Invited Talk**

Parity-Time symmetry and exceptional points in Bose-Einstein condensates

Thursday 29 November 2018 14:50 (25 minutes)

Parity-time (PT) symmetric quantum mechanics has attracted ever-increasing attention over recent years because it offers a class of complex Hamiltonians which, in spite of their non-Hermiticity, can possess discrete real eigenvalue spectra. Moreover, these Hamiltonians feature the property of exceptional points, i.e., points in parameter space where both energy values and eigenfunctions coincide, a phenomenon impossible in Hermitian quantum mechanics (but known to appear for resonances in the continuum).
Because of the formal equivalence of the Schrödinger equation and the Helmholtz equation of electrodynamics, the properties of such operators have meanwhile been observed in a multitude of classical laboratory experiments –e.g. optical waveguides, microwave resonators and metamaterials. A bona fide quantum mechanical realisation of PT-symmetric systems is still lacking. A strong candidate is a Bose-Einstein condensate in a multi-well potential, or in a tilted optical lattice. The idea ist to outcouple atoms from one well and incouple them coherently into the other. By numerically solving the underlying nonlinear Gross-Pitaevskii equation, but also by going beyond the mean-field description using Lindblad superoperators, I will demonstrate that PT-symmetric Bose-Einstein condensates with balanced gain and loss are indeed good candidates for the first observation of PT symmetry in a real quantum system.

Content of the contribution

Theory

Author: WUNNER, Guenter (University of Stuttgart)

Presenter: WUNNER, Guenter (University of Stuttgart)

Session Classification: PT symmetric Hamiltonians

Track Classification: [9] PT symmetric Hamiltonians