Seminario

Ofri Adiv

Department of Physics, University of Auckland, New Zealand

terrà un seminario dal titolo

Nonlinear Dynamics of Coupled Light-Matter

Abstract:

Interactions between many-body atomic systems and light have received much attention, both recently and in the past, due in part to advances in quantum technologies. More specifically, within models of such light-matter systems, the Dicke model has long been a focus of research for its applicability to a range of scenarios, and for the quantum phase transitions it exhibits. Originally, it describes the interaction between an ensemble of atoms and light in an optical cavity. At a critical value of the light-matter coupling the system undergoes a quantum phase transition to superradiance, where the ensemble emits coherently into the cavity. We continue this line of research by investigating a pair of atomic ensembles confined to two separate optical cavities, which couple to one another through the exchange of photons. We do so with a view towards quantum information processing, where networks of coupled quantum subsystems, such as atomic ensembles, can influence each other so that their interactions can be tailored. Our analysis is rooted in dynamical systems theory and centers around the differential equations that govern the evolution of quantum-mechanical expectations. In this framework behaviours of the quantum system correspond to different dynamical objects, and their bifurcations to quantum phase transitions. This translation allows us to paint a detailed dynamical picture, revealing periodic behaviour, quasiperiodic oscillations, chaotic dynamics, and their organisation in phase space.

1/10/2025, ore 11:15, Aula Boltzmann (plesso fisica)