SEMINAR: Thermalization with noncommuting conserved quantities

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12:00 to 13:00
Seminar Room

Thermodynamic systems typically conserve quantities (i¿½chargesi¿½) such as energy and particle number. The charges are often assumed implicitly to commute with each other. Yet quantum phenomena such as uncertainty relations rely on observables' failure to comm te. How do noncommuting charges affect thermodynamic phenomena? This question, pon arising at the intersection of quantum information theory and thermodynamics, sp ead recently across many-body physi
s. Until recently, the issue has remained theoretical. I will give an overv ew of noncommuting-charge thermodynamics, focusing on our experimental testing f its predictions, with a trapped-ion simulator. We prepare 6-21 spins in an appro imate microcanonical subspace, a generalization of the microcanonical subspa e for accommodating noncommuting charges, which cannot necessarily have well-d fined nontrivial values simultaneously. We simulate a Heisenberg evolution using laser-i duced entangling interactions and collective spin rotations. The noncommuting charges a e the three spin components. We find that small subsystems equilibrate to near a re ently predicted non-Abelian thermal state. This work bridges quantum many-body simulat rs to the quantum thermodynamics of noncommuting charges, the predictions of which c n now be tested.

Hosted by: Prof. Dr. Maciej Lewenstein