Karlsruher Institut für Technologie

KIT-Fakultät für Physik

Einladung zum Physikalischen Kolloquium

06.06.2025 **Igor Gornyi, Karlsruher Institut für Technologie**

»Manipulating quantum systems by looking at them: Measurement-induced steering and phase transitions«

Einführung: M. Garst

Recent years have witnessed an extreme surge of interest in phenomena driven by quantum measurements, particularly in view of related challenges in the context of quantum information processing. This talk will overview two emerging concepts: (i) measurement-induced steering of quantum states and (ii) measurement-induced phase transitions.
Steering exploits the backaction of projective measurements performed on detectors coupled to the system, which arises from entanglement generated during their joint evolution, for the preparation and manipulation of quantum states. Passive steering refers to protocols that are predesigned and implemented independently of the specific sequence of detector readouts. This framework is further extended by including an active-decision choice of the system-detector interactions, which can be viewed as "navigation in many-body Hilbert space" based on the information extracted through measurements.
The competition between measurements and the system's unitary dynamics may lead to phase transitions in monitored quantum systems. The measurement-induced entanglement transition—a transition in the system-size scaling of the entanglement entropy—is, perhaps, the most famous one in this context. Mysteriously, this transition is only seen in those characteristics of monitored quantum systems that are nonlinear in the density matrix, whereas the averaged dynamics remains blind to this transition. The analytical approach to this class of phenomena bears a strong resemblance to the theory of Anderson localization, showcasing the fundamentals of quantum mechanics in modern condensed matter physics.

Der Vortrag findet **am Freitag, den 06. Juni 2025 um 15:45 Uhr im Otto-Lehmann-Hörsaal**, Physik-Flachbau (Geb. 30.22), KIT-Campus Süd statt.

Karlsruher Institut für Technologie (KIT)
Universitätsaufgabe • Campus Süd
KIT-Fakultät für Physik

Physik-Hochhaus, Geb. 30.23
76128 Karlsruhe
Wolfgang-Gaede-Straße 1

www.physik.kit.edu
fakultaet@physik.kit.edu
Tel.: (07 21) 6 08 – 4 35 18