SFB 1432
Colloquium

SFB 1432

Universität Konstanz

Prof. Dr. Anja Metelmann
Karlsruhe Institute für Technologie &
University of Strasbourg (FR)

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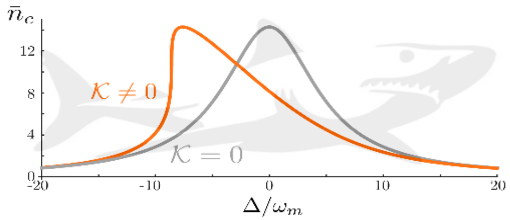
Talk 15:15
P 603
snacks afterwards

Nonlinearity and Dissipation as a Formidable Resource in Engineered Quantum Systems



Engineered quantum systems are artificial mesoscopic systems whose dynamics are governed by the laws of quantum mechanics. Prominent examples of these mesoscopic systems are ultracold trapped atoms and ions, superconducting circuits and electro/optomechanical systems. These systems are powerful candidates for future quantum technologies and to study the basic laws of quantum mechanics. Every platform comes with its unique challenges, but all face the general issue of (unwanted) nonlinear processes and dissipation. However, in this talk we will discuss how dissipation and nonlinearity can be utilized to form a profitable resource for control, manipulation and read-out of engineered quantum systems. This includes the fascinating aspect of turning dissipation, which in general limits the performance of an experiment, into an advantageous tool. The concept of dissipation engineering has enriched the methods available for state preparation, dissipative quantum computing and quantum information processing. In this talk we will show how engineered dissipative processes allow for new effects to emerge, for example that any factorisable (coherent) Hamiltonian interaction can be rendered nonreciprocal if balanced with the corresponding dissipative interaction. This powerful concept can be exploited to engineer nonreciprocal devices for quantum information processing, computation and communication protocols, e.g., to achieve control over the direction of propagation of photonic signals. In addition, we present theoretical and experimental results for enhanced back-action cooling in nonlinear magnetomechanical systems.

Contact:
W. Belzig, 4782

sfb1432.uni.kn