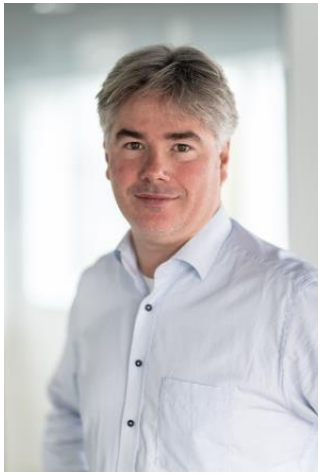
Physikalisches Kolloquium

Universität Konstanz

Do 17.06.21
15:15 Uhr
Zoom-Meeting:
https://zoom.us/j/96732274542?pwd=RU5DV0dWbHZyL2VoYzBOQVZnWFJwQT09



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Hybrid quantum systems based on superconducting circuits

Hybrid quantum systems unite constituents with different quantum capabilities, which allows to realize novel functionalities. This makes hybrid quantum systems highly attractive for all pillars of quantum science. We use superconducting quantum circuits operating at GHz-frequencies as a toolbox to investigate, understand and realize hybrid quantum systems. Hereby, we take advantage of the fact that the building blocks for superconducting circuits are mature, and that elements providing the “quantum” are readily available. In the presentation, I will discuss two types of hybrid quantum systems based on superconducting circuits: (i) An ensemble of paramagnetic spins coupled to a microwave resonator, yielding spin-photon hybrid states, and (ii) an optomechanical system consisting of a microwave resonator combined with a nano-string mechanical oscillator. In part (i), I will focus on the occurrence of self-stimulating spin echoes, which originate from the interplay of highly coherent spin states with microwave resonator modes in the strong-coupling limit. In part (ii), I will present our current experiments with the optomechanical hybrid system, which has the potential to reach the strong vacuum coupling regime of optomechanics. Both hybrid systems (i) and (ii) not only show exciting physics, but are also discussed in the context of quantum memory applications and microwave to optics conversion schemes. In particular, an intriguing next step will be to utilize qubits to combine these efforts with microwave quantum states.