PHYSIK

THEORETISCH PHYSIKALISCHES KOLLOQUIUM

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Making quantum control work: A case study for quantum computers

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Quantum optimal control is a theoretical framework that allows to design experimental control fields - lasers, microwaves and others - such that a quantum system follows a desired time evolution. Originally pioneered and well established in chemical physics it is finding its way into contemporary quantum technologies. This transition poses new challenges. I will describe this program along the example of superconducting qubits. There, the DRAG/WAHWAH family of controls describes simple schemes that allow to avoid state leakage to unwanted energy levels and that can be understood by adiabatic perturbation theory. When applying less intuitive, numerically determined pulses, it is a key challenge to calibrate those to the human-made and hence imprecisely characterized system at hand. This requires, on the one hand, still sparse pulse descriptions as they can readily be found with the GOAT technique, on the other hand, it requires reliable and robust characterization of quantum gates with, e.g., the randomized benchmarking protocol. We expect that this method will be able to significantly reduce gate errors in popular cloud quantum computing platforms such as the IBM quantum experience.

Gäste sind herzlich willkommen.

Die Dozenten der Theoretischen Physik

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