Quantum States on Demand

Initiative: Freigeist-Fellowships

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This project explores new directions in theoretical quantum physics, investigating novel applications such as quantum computing, quantum cryptography, or quantum-enhanced measurements. The biggest challenge towards the realization of such revolutionary technologies is the controlled production of quantum states of many particles with well-defined properties. However, the theoretical analysis of such quantum states is extremely challenging, as nonclassical collective effects play a dominant role, which can only be understood when treating the many-particle quantum system as a whole. In particular, the project investigates how controlled noise from the environment can steer a quantum system into a highly nonclassical state, which then can be used within novel computing and communication technologies, as well as for making precise measurements or controlled manipulations inside biological systems. This approach will be applied to a wide class of physical settings, ranging from laserexcited ultracold atoms to magnetic impurities in diamond at room temperature, with each offering their own benefits for particular applications.

Projektbeteiligte

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Open Access-Publikationen

Simulation methods for open quantum many-body systems