Experimentelle Physik 2

Seminar Festkörperphysik (CMP Seminar)

Aktuelle Probleme der Festkörperphysik für Studenten und Mitarbeiter
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Moiré Cavity-Quantum Electrodynamics

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Quantum emitters are a key component in photonic quantum technologies. Enhancing single-photon emission by engineering their photonic environment is essential for improving overall efficiency in quantum information processing. However, this enhancement is often limited by the need for ultra-precise emitter placement within conventional photonic cavities. In this presentation, I will introduce a novel multilayer moiré photonic crystal with a robust isolated flatband, which is inspired by fascinated physics of moiré pattern, we propose. Theoretical analysis reveals that, with nearly infinite photonic density of states, the moiré cavity simultaneously possess high Purcell factor and large tolerance over emitter's position, breaking constraints of conventional cavities. We then experimentally demonstrate various cavity-quantum electrodynamic phenomena with a quantum dot in moiré cavity. A large tuning range (up to 40-fold) of QD's radiative lifetime is achieved through strong Purcell enhancement and inhibition effects. Our findings open the door for moiré flatband cavity-enhanced quantum light sources and quantum nodes for the quantum internet. In addition, I will also briefly mention how to generate single photon/entangled photons and manipulate a new type of hole orbital qubits in QDs.