Halbleiter-Nanophotonik

SFB 787

Einladung

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Ort: **Technische Universität Berlin**
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Thema: **„Manipulating single photons: From single Quantum dots to monolayer transition-metal dichalcogenides"**

Abstract:

Single photons have been proposed as promising quantum bits for quantum information processing. A high level of efficiency and indistinguishability is a key prerequisite for the application of single photons in quantum computing and solid-state networks. By applying resonant s-shell optical excitation with picoseconds laser pulses, the on-demand and highly indistinguishable single photons can be achieved. Utilizing these single photons, basic quantum logic gates can be demonstrated. Adiabatic rapid passage is considered as a robust method against fluctuation of driving pulse area and moments of solid-state emitters, with which we can demonstrate deterministic and robust generation of pulsed resonance fluorescence single photons from a single semiconductor quantum dot. The experiment results revealed a vanishing two photon emission probability of 0.3% and a raw(corrected) two-photon HOM interference visibility of 97.9%(99.5%), reaching a precision that places single photons at the threshold for fault-tolerant surface-code quantum computing. Through driving the single quantum dot trion Λ-system under Voigt magnetic field, all-optically tunable and highly indistinguishable spin-flip single Raman photons are generated. Here we present high-visibility quantum interference of two single photons from remote QDs. Combined with the established spin-photon entanglement, spin teleportation between two remote QDs could be performed through quantum interference of two spin-tagged single photons from independent QDs. When a two level system is driven by strong optical field, the dressed state will be performed and the Mollow fluorescence triplet arises. Beyond the dressed state, double dressed state is formed on strong bichromatic driving fields and reveals dynamical cancellation the spontaneous emission spectral line, multiphoton ac Stark effect and modifications of Mollow triplet. Finally, a new Single Quantum Emitter in 2D quantum materials is discovered in 2D tungsten-diselenide(WSe2) monolayers. The optical emission from these emitters shows narrow linewidths of ~130μeV, about two orders of magnitude smaller than those of delocalized valley excitons. The HBT measurements reveal a strong photon antibunching and magnetic field dependence shows an exciton g factor of ~8.7, several times larger than those of delocalized valley excitions. These results may open up a new avenue towards photonic quantum devices based on 2D semiconductors.

Gäste sind herzlich willkommen!
Prof. Dr. S. Reitzenstein