HL 20: Invited Talk Yakovlev

Time: Tuesday 14:00–14:45 Location: HSZ 01

Invited Talk HL 20.1 Tue 14:00 HSZ 01

Electron spin coherence in singly charged quantum dots — •Dmitri R. Yakovlev — Experimentelle Physik 2, Technische Universität Dortmund, Germany

We present experimental and theoretical study on electron spin coherence in ensemble of n-type doped InGaAs/GaAs quantum dots containing one electron per dot. A pump-probe time-resolved Faraday rotation technique is exploited. Long-lived spin precession of resident electrons in external magnetic fields is observed with the dephasing time of spin ensemble exceeding 6 ns. Rabi oscillations of the Faraday rotation amplitude are detected confirming the suggested model of generation electron spin coherence via excitation of coherent superposition of the trion state and the resident electron. We show that the ensemble dephasing can be overcome by using a periodic train of light pulses to synchronize the phases of the precessing spins. This mode-locking leads to constructive interference of contributions to Faraday rotation, and presents potential applications based on robust quantum coherency within an ensemble of dots. Under these experimental conditions spins of the dots nuclei are aligned in a way that all dots in the ensemble contribute to the coherent signal with a potential to focus the electron Larmor frequencies in the ensemble to a single mode. This optical technique allows to measure the spin coherence time of a single quantum dot of 3 microseconds. This work is done in collaboration with A. Greilich, I. A. Yugova, S. Spatzek, M. Bayer, A. Shabaev, Al. L. Efros, S. E. Economou, T. L. Reinecke, D. Reuter and A. D. Wieck.