

Electron and exciton spin dynamics in quantum dots

M.M. Glazov

*Ioffe Physical Technical Institute, Polytekhnicheskaya 26,
St. Petersburg 194021, Russia*

The advanced seminar is aimed at the analysis of the spin coherence generation, manipulation and detection processes in semiconductor quantum dots by means of optical pulses.

The following problems will be addressed:

1. Selection rules and basic principles of optical orientation in semiconductors and semiconductor nanostructures.
2. Optical transitions in quantum dots: two-level model, transformation of electron wavefunction by the optical pulse, Rabi oscillations. Impact of selection rules: quantum disks vs. spherical nanocrystals.
3. Optical control of electron spins in quantum dots.
4. Spin Faraday, Kerr and ellipticity effects in quantum dots. Role of ensemble inhomogeneity.
5. Electron spin precession in the external magnetic field.
6. Spin accumulation caused by the train of pump pulses. Resonant spin amplification and mode-locking of electron spin coherence. Nuclei-induced electron spin precession frequency focusing.

- [1] M.M. Glazov, Physics of the Solid State **54**, 1 (2012)
- [2] I.A. Yugova, M.M. Glazov, E.L. Ivchenko, and Al.L. Efros, Phys. Rev. B **80**, 104436 (2009)
- [3] A. Greilich, D.R. Yakovlev, A. Shabaev, Al.L. Efros, I.A. Yugova, R. Oulton, V. Stavarache, D. Reuter, A. Wieck, and M. Bayer, Science **313**, 341 (2006)
- [4] M.M. Glazov, I.A. Yugova, S. Spatzek, A. Schwan, S. Varwig, D.R. Yakovlev, D. Reuter, A.D. Wieck, and M. Bayer, Phys. Rev. B **82**, 155325 (2010)
- [5] A. Greilich, Sophia E. Economou, S. Spatzek, D.R. Yakovlev, D. Reuter, A.D. Wieck, T.L. Reinecke, and M. Bayer, Nat. Phys. **5**, 262 (2009)
- [6] A. Greilich, A. Shabaev, D.R. Yakovlev, Al.L. Efros, I.A. Yugova, D. Reuter, A.D. Wieck, and M. Bayer, Science **317**, 1896 (2007)
- [7] M.M. Glazov, I.A. Yugova, and Al.L. Efros, Phys. Rev. B **85**, 041303(R) (2012)