Seminarankündigung

Dienstag, 13. Juli 2021
16:00 Uhr

ONLINE via ZOOM

“Chiral nano-photonic using quantum dots”

In this seminar, I will review progress towards implementing chiral quantum photonics in GaAs nano-photonic waveguides. The chiral coupling occurs when a semiconductor quantum dot (QD) is positioned close to a C-Point (chiral point) of the waveguide. The off-centre positioning of the QD breaks the inversion symmetry, and results in a strong dependence of the propagation direction on the circular polarization of the optical mode, with spin up and spin down exciton spins coupling to the left and right propagation directions respectively. In previous work we demonstrated incoherent, spin-dependent directional photoluminescence and initialization using non-resonant and quasi-resonant excitation [1, 2]. In this presentation, I will present results for coherent, resonant excitation in transmission and reflection geometries [3]. Numerical simulations for a quantum two-level system are able to reproduce the observed behaviour, and indicate that the spin-dependent phase shift in transmission is around 0.1□ in the current devices. Strategies to increase the phase shift towards the ideal value of □ required to implement chip-based spin networks will be discussed. I will conclude by discussing progress in observing directional emission for edge-state mode in topological crystals [4].

References
1. Coles, R.J. et al., Nature Communications, 7, 11183 (2016)
2. Coles, R.J. et al., Phys. Rev. B, 95, 121401(R) (2017)
3. Hurst, D.L. et al., Nano Letters, 18, 5475 (2018)
4. Jalali Mehrabad, M., et al, Optica, 7, 1690 (2020)

Prof. A. Mark Fox
Department of Physics & Astronomy
University of Sheffield
United Kingdom