Seminarankündigung

Dienstag, 10. Mai 2022
13:30 Uhr

ONLINE via ZOOM

https://tum-conf.zoom.us/j/63210679333
Meeting-ID: 632 1067 9333
Kenncode: 075076

“Development and physics of quantum dot devices for applications in photonic quantum technology”

Photonic quantum devices are key building blocks for the implementation of quantum communication protocols and for the realization of photonic quantum processors. Moreover, they allow one to explore exciting physics in the quantum regime of single emitters and single photons. Of particular interest are devices generating, routing, processing and detecting single photons which act as information carriers in the field of photonic quantum technologies. In this talk I present recent progress in the development and deterministic fabrication of high-performance single-photon sources and on-chip quantum circuits based on semiconductor quantum dots. Here, quantum dots act as close-to-ideal photon emitters with high quantum efficiency and excellent quantum nature in terms of single-photon purity and photon indistinguishability. Using an advanced nanoprocessing technology platform, deemed in-situ electron beam lithography, we pre-select suitable quantum dots and integrate them with nm accuracy into photonic nanostructures such as circular Bragg gratings to enhance the brightness of the sources [1, 2], to realize fiber-coupled stand-alone single-photon sources [3, 4, 5], and to enable the development of highly functional quantum circuits [6-8]. The talk gives insight into the physics of such devices and discusses technological challenges, present limitations as well as future prospects of semiconductor quantum dot based quantum devices.

[1] M. Gschrey et al., Nature Communications 6, 7662 (2015)
[2] J. Schall et al., Advanced Quantum Technologies 4, 2100002 (2021)
[3] A. Schlehahn et al., Scientific Reports 8, 1340 (2018)
[4] A. Musial et al., et al. Advanced Quantum Technologies 3, 2000018 (2020)
[5] L. Bremer et al., Optics Express 30, 15913-15928 (2022)
[6] Schnauber P. et al., Nano Letters 18, 2336-2342 (2018)
[7] Mrowiński, P. et al., ACS Photonics, 6, 2231 (2019)
[8] Schnauber P. et al., Nano Letters 19, 7164 (2019)

Prof. Stephan Reitzenstein
Institut für Festkörperphysik
Technische Universität Berlin
Germany