SFB/TRR 21 - Colloquium

2. Juni 2017, Stuttgart

Stephan Reitzenstein
(Technische Universität Berlin)

Quantum Light Sources based on deterministically fabricated Quantum Dot - Microlenses

The emerging field of photonic quantum technologies relies crucially on the availability of practical quantum light sources. Prime candidates to realize such sources are self-assembled semiconductor quantum dots (QDs). This is explained by their superb optical properties in terms of quantum efficiency, single photon purity and photon indistinguishability. Moreover, QDs allow for the generation of entangled photon pairs and more complex photon states, such as photonic cluster states. Still, it is a great challenge to further develop these key building blocks beyond proof-of-principle demonstrations towards scalable quantum devices enabling advanced systems like multi-partite quantum networks.
In this talk, I will report on recent advances in the development of QD based devices with a focus on the realization of practical and efficient quantum light sources for future photonic quantum networks. This includes important aspects such efficient light extraction strategies, deterministic nanoprocessing technologies, the quantum optical evaluation and direct fiber coupling of the photon sources [1]. In particular, I will introduce in-situ electron beam lithography, which allows for the realization of quantum dot - microlenses with high process yield and excellent quantum optical properties [2, 3]. The talk will conclude with an outlook on efficient multi-photon sources based on the biexciton-exciton cascade of QDs [4, 5].
References:
[1] A. Schlehahn et al., arxiv:1703.10536 (2017)
[2] M. Gschrey et al., Nat. Commun. 6, 7662 (2015)
[3] A. Thoma et al., Phys. Rev. Lett. 116, 033601 (2016)
[4] T. Heindel et al., Nat. Commun. 8, 14870 (2017) [5] S. Bounouar et al., Phys. Rev. Lett., in press (2017)

2. Juni 2017, 14:00 Uhr

Universität Stuttgart, NWZII, Raum 2.136
Pfaffenwaldring 57, 70569 Stuttgart

CO.CO.MAT