Halbleiter-Nanophotonik

SFB 787

Einladung

Es spricht: **Dr. Ana Predojević**
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Ort: **Technische Universität Berlin**
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Thema: **"Coherence and degree of time-bin entanglement from quantum dots"**

Abstract:

Single semiconductor quantum dots, due to their discrete energy structure, constitute an antibunched single photon source at a well-defined frequency and with inherently sub-Poissonian statistics. They generate single photons through a recombination of an electron-hole pair formed by an electron from the conduction band and hole from the valence band. In a more refined operation mode employing biexcitons, quantum dots can provide pairs of photons emitted in a fast cascade very similar to the original atomic cascade experiment by Aspect et al. [1]. It has been demonstrated that in the absence of the fine structure splitting of the exciton levels, such a cascade exhibits polarization entanglement.

In addition, it has been shown that the biexciton-exciton cascade can also be entangled in its emission time (time-bin) [2]. The requirements to generate this type of entanglement include the suppression of the single exciton probability amplitude in the excitation pulse and the lowest possible degree of dephasing caused by the laser excitation. These conditions constitute contradictory demands on the excitation pulse-length and its intensity. We studied these limitations from an experimental and a theoretical point of view. We find an optimized operation regime for the system under consideration and provide guidelines on how to extend this study to other similar systems. Beyond the generation of time-bin entanglement our study also indicates a generalized method to achieve very high photon pair generation probability from quantum dots [3]. In particular, it shows that an optimal excitation process requires a trade-off between the biexciton binding energy and the excitation laser pulse length.

References

[1] A. Aspect, J. Dalibard, and G. Roger, Phys. Rev. Lett. **49**, 1804 (1982).
[2] H. Jayakumar, A. Predojević, T. Kauten, T. Huber, G. S. Solomon, and G.Weihs, Nature Communications **5**, 4251 (2014).
[3] T. Huber, L. Ostermann, M. Prilmüller, G. S. Solomon, H. Ritsch, G. Weihs, and A. Predojević, arXiv:1506.02429 (2015).

Gäste sind herzlich willkommen!
Prof. Dr. S. Reitzenstein