Physikalisches Institut
Fakultät für Mathematik und Physik
Albert-Ludwigs-Universität Freiburg

IRTG-Seminar

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“Quantum technologies with color center in diamond”

Color centers in diamond appeared as important and valuable quantum systems for emerging quantum technologies, including the fields of quantum processing, quantum key distribution quantum communication, information processing, quantum metrology and many more. These systems benefit from the properties of their host material, namely diamond. Diamond has a band gap of 5,4 eV, that allows certain impurities to form energy levels in this band gap. Those energy levels are decoupled from the valance and conduction band and can therefore be considered as an artificial atom-like system trapped in the diamond matrix. The level splitting of those artificial atoms is in the range of visible light. Absorption of parts of the light colors some diamond, and therefore those system are called color centers. Many different color centers are known, but yet for many of them the distinct properties and level structures are unknown. The most popular one is the so called nitrogen-vacancy center in diamond, which already showed it magnificent properties for spin-manipulation and sensing. Over the last year another color center shifted the focus on itself, the silicon vacancy center. The silicon-vacancy (SiV) center has shown exceptional spectral properties. More than 70% of the emitted photons contribute to its strong zero phonon line (ZPL). The strong, sharp and distinct ZPL transitions together with the weak sideband make the SiV center a promising candidate for single photon generation and technologies based on photon matter interaction.

[1] Schirhagl et al., Annu. Rev. Phys. Chem. 2014. 65:83–105
[2] Doherty et al., Physics Reports 528 (2013) 1–45
[3] L.J.Rogers et al., PRB. 89, 235101 (2014)
[4] L.J.Rogers et al., Nature Comm. 5, 4739 (2014)
[5] L.J.Rogers et al., PRL.113, 263602 (2014)
[6] A. Sipahigil et al., PRL 113, 113602 (2014)

Tuesday, November 17, 2015, 4:00 p.m., HS II, Physik-Hochhaus, Hermann-Herder-Str. 3

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