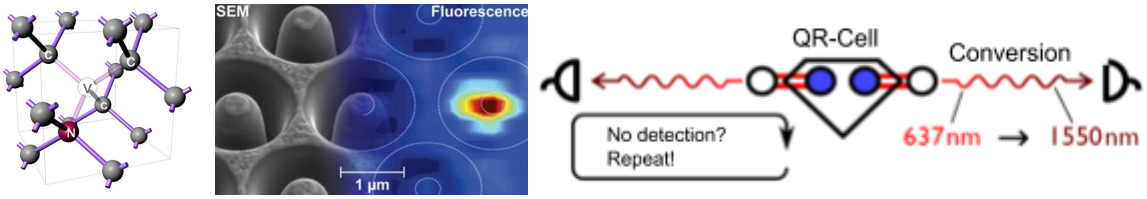
AG Nanooptik, Prof. Oliver Benson
Emmy Noether Gruppe Nichtlineare Quantenoptik, Dr. Sven Ramelow

2 Free PhD Positions

We are planning the announcement of two experimental PhD positions in the field of nanooptics and nonlinear quantum optics at the Department of Physics, Humboldt-University Berlin on the topic:

„Transfer of Spin-Photon-Entanglement with N-V centers“



Quantum communication opens up new possibilities to transmit data securely. However, in contrast to classical information transmission in optical fibers, today's fiber-based quantum communication systems have a physically limited, maximum range. This range can be extended with so-called quantum repeaters. A promising possibility to realize quantum repeater nodes is based on N-V centers in diamond and exploits the advantages of long coherence times of electron and nuclear spins in combination with efficient optical transitions as an interface to photons. However, since these with a wavelength of 637 nm are not suitable for the low-loss transmission in optical fibers, they must be converted to the telecom band at 1550 nm while preserving entanglement.

Two experimental dissertation topics are planned:

1) The single-photon conversion of photons entangled with NV centers at 637 nm into the telecom band allows for the lowest-loss and thus longest possible transmission in optical glass fibers. The focus is on the implementation and characterization of different approaches to achieve the best possible efficiency with minimal background noise. This includes the construction of an entangled, two-color photon pair source necessary for the comprehensive characterization and the construction of compact, fiber-coupled modules for the frequency conversion of entangled 637 nm photons into the telecom band, as well as their final integration and operation in a demonstrator path.

2) Diamond samples with photonic structures and MW antennas should be numerically optimized, manufactured and tested. Automated measurement setups are created to select the best color centers with the highest photon emission rate from a large number of samples. Fiber-coupled units for quantum network modules are to be realized with the selected color centers. For this, the electron spin of each color center is entangled with the polarization of the emitted photon, which is emitted directly into an optical fiber. This allows a direct coupling to frequency conversion units and thus a connection to the Telecom C band at 1550 nm.

If you are interested in one of these topics and have questions on the topic, work environment or the application / application deadline and requirements, then write to us:

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