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Optical interfacing single molecules with atomic vapor PETR SIYUSHEV, GUILHERME STEIN, 3. Physics Institute and Research Center SCoPE, University of Stuttgart, Germany, JÖRG WRACHTRUP, ILJA GERHARDT, 3. Physics Institute and Research Center SCoPE, University of Stuttgart, Germany and Max Planck Institute for Solid State Research, Stuttgart, Germany — Organic molecules at liquid Helium temperatures can constitute high-brightness and narrow-band single photon sources. Thus, they might form an important building block for quantum information processing. A number of quantum optical experiments were conducted with single photon sources based on single molecules. It was shown that it is possible to spectrally detune the molecules, and optical interaction between several molecules could be shown. Another important ingredient for quantum information processing is the implementation of quantum memory. Atomic vapors do not only allow for slowing down light, but also for its storage and can be used as an efficient quantum memory. In the past it was impossible to utilize the high brightness of single molecules in combination with an efficient quantum memory, since the lack of spectral overlap. Here, we present spectral tuning of a single molecule to match the resonance of the sodium D-line. We reach up to 6×10^5 detected 30 MHz narrow-band single photons per second. We are able to slow down near-resonant photons from a single molecule, and simultaneous show its single photon properties. We are further able to explore the properties of atomic vapor for its use as a narrow-band filter for single molecule studies.

Jörg Wrachtrup
3. Physics Institute, University of Stuttgart, Germany

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