***A quantum hybrid system of a single organic molecule and atomic vapor***

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Single molecules at cryogenic conditions allow for bright and simultaneous narrow-band single photon generation. The molecular emission of dibenzantanthrene (DBATT) matches spectrally to the sodium D-line transitions (~589nm), such that we are able to combine single molecule studies with atomic spectroscopy. Optical filtering the Stokes-shifted emission by atomic vapor allows for higher detection rates and a higher signal-to-noise ratio in single molecule studies. A changed excitation scheme allows the generation of 5.5x10^5 photons, with a spectral width of 25MHz. These photons can spectrally match the sodium line, such that we are able to show a significant reduction of the group velocity due to strong dispersional changes in atomic vapour. This allows for the creation of quantum memory, as indicated elsewhere [2]. In the short term, the single photons we are able to create can be used for quantum key distribution in daylight [3] as the solar spectrum shows a drop below 4% in the frequency of interest.

[1] Petelski et al. (2003), Eur. Phys. J. D 22:279–283
[2] Lvovsky et al. (2009), Nat. Photonics 3:709-714
[3] Peloso et al. (2009), NJP, 11 045007