A cavity-enhanced spin-photon interface for color centers in diamond

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Building a long-distance quantum network is one of the big challenges in the field of quantum communication, which requires the development of a quantum repeater. A crucial component of this device is an efficient, coherent spin photon interface. Coupling color centers in diamond to a microcavity shows promise as a viable approach.
In our experiments, we integrate diamond membranes into open access fiber-based Fabry-Perot microcavities to attain emission enhancement into a single well-collectable mode [1,2]. We present our fully tunable, cryogenic cavity platform operating either in a dilution or closed-cycle cryostat where we achieve a picometer mechanical stability [3]. By utilising this versatile platform, we show Purcell-enhanced fluorescence of an ensemble of nitrogen vacancy (NV) centers [4] as well as first results from a single tin vacancy (SnV) coupled to a cryogenic cavity.

References

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Figures

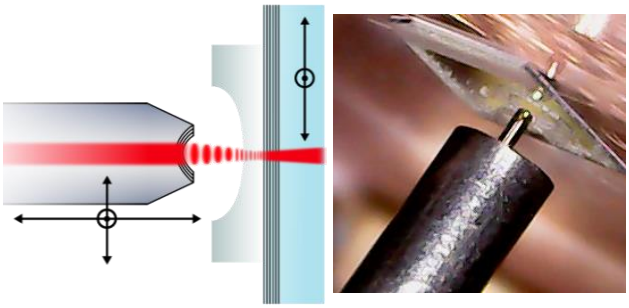

Figure 1: A fully tunable fiber-based Fabry-Perot microcavity. The diamond membrane is integrated via a van der Waals-Bond [5].

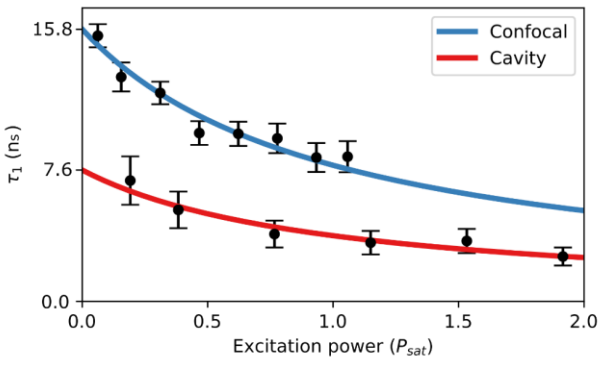

Figure 2: Purcell-enhancement of an ensemble of NV centers apparent as a lifetime shortening. The lifetime was extracted from the antibunching time constant of a power-dependent set of $g^{(2)}$ measurements.