

Abstract Submitted  
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**A Microscopic Fabry-Perot Cavity for Quantum Optics with NV Centers** ERIKA JANITZ, YANNIK FONTANA, Quantum Defects Lab, McGill University, Montreal Quebec, MAXIMILIAN RUF, Sankey Lab, McGill University, Montreal Quebec, MARK DIMOCK, Quantum Defects Lab, McGill University, Montreal Quebec, JACK SANKEY, Sankey Lab, McGill University, Montreal Quebec, LILIAN CHILDRESS, Quantum Defects Lab, McGill University, Montreal Quebec — We report on efforts to couple nitrogen vacancy (NV) centers in diamond membranes to optical cavities formed by a microscopic mirror on the tip of an optical fiber and a macroscopic flat mirror. These cavities could dramatically increase the fraction of coherent photons emitted in the NV center zero phonon line (ZPL) at low temperature, which can be used to generate interactions between distant spins. We will present room temperature characterization results from a cavity containing a few-microns thick diamond membrane, where it should be possible to observe cavity coupling to a single NV center via phonon-assisted cavity feeding. At low temperature, the ZPL optical transitions are narrowed and the cavity length must be stabilized to within a cavity linewidth (on the order of 10 pm). We will present our preliminary low temperature fiber cavity designs that should achieve this level of stability using the Pound-Drever-Hall cavity locking technique and a custom vibration isolation platform.

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