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Cavity QED of silicon vacancy centers with a silica optical micro resonator[1] ABUGAIL PAULS, IGNAS LEKAVICIUS, HAILIN WANG, Univ of Oregon — Negatively charged silicon-vacancy (SiV) centers in diamond feature an inversion symmetry making the SiV optical transitions robust against charge fluctuations in the surrounding environment. SiV centers have been successfully integrated into photonic crystals for cavity QED studies and for the development of optical quantum networks. Diamond photonic crystals, however, feature a relatively broad optical linewidth (˜50 GHz), limiting this platform to the bad cavity limit in cavity QED. We have developed an experimental platform combining a thin (˜110 nm thick) SiV implanted diamond membrane with a tunable silica optical microresonator with a diameter near 50 micrometers. PLE spectra of SiV centers at 10 K show linewidths ranging from 200 to 300 MHz for membranes as thin as 100 nm. This composite system features an optical cavity linewidth as narrow as 40 MHz, enabling the achievement of the good cavity limit in cavity QED. For cavity QED studies, a diamond membrane is in contact with a silica microresonator. This composite cavity QED system provides a highly promising platform for pursuing cavity QED of SiV centers in the good cavity limit.

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