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Strain engineering of diamond silicon vacancy centers in MEMS cantilevers SRUJAN MEESALA, YOUNG-IK SOHN, HAIG ATIKIAN, JEFFREY HOLZGRAFE, MIAN ZHANG, MICHAEL BUREK, MARKO LONCAR, Harvard University, John A. Paulson School of Engineering and Applied Sciences — The silicon vacancy (SiV) center in diamond has recently attracted attention as a solid state quantum emitter due to its attractive optical properties. We fabricate diamond MEMS cantilevers, and use electrostatic actuation to apply controlled strain fields to single SiV centers implanted in these devices. The strain response of the four electronic transitions of the SiV at 737 nm is measured via cryogenic (4 K) photoluminescence excitation. We demonstrate over 300 GHz of tuning for the mean transition frequency between the ground and excited states, and over 100 GHz of tuning for the orbital splittings within the ground and excited states. The interaction Hamiltonian for strain fields is inferred, and large strain susceptibilities of the order 1 PHz/strain are measured. We discuss prospects to utilize our device to reduce phonon-induced decoherence in SiV spin qubits, and to exploit the large strain susceptibilities for hybrid quantum systems based on nanomechanical resonators.

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