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Complete Quantum Control of a Single Silicon-Vacancy Center in a Diamond Nanopillar[1] JINGYUAN LINDA ZHANG, KONSTANTINOS G. LAGOUDAKIS, YAN-KAI TZENG, CONSTANTIN DORY, MARINA RADULASKI, YOUSIF KELAITA, ZHI-XUN SHEN, NICHOLAS A. MELOSH, STEVEN CHU, JELENA VUCKOVIC, Stanford University — Coherent quantum control of a quantum bit (qubit) is an important step towards its use in a quantum network. SiV^- center in diamond offers excellent physical qualities such as low inhomogeneous broadening, fast photon emission, and a large Debye-Waller factor, while the fast spin manipulation and techniques to extend the spin coherence time are under active investigation. Here, we demonstrate full coherent control over the state of a single SiV^- center in a diamond nanopillar using ultrafast optical pulses. The high quality of the chemical vapor deposition grown SiV^- centers allows us to coherently manipulate and quasi-resonantly read out the state of the single SiV^- center. Moreover, the SiV^- centers being coherently controlled are integrated into diamond nanopillar arrays in a site-controlled, individually addressable manner with high yield, low strain, and high spectral stability, which paves the way for scalable on chip optically accessible quantum system in a quantum photonic network.

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