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Universal set of quantum gates for electron defect spin qubits in diamond and silicon carbide DMITRY SOLENOV, SOPHIA E. ECONOMOU, THOMAS L. REINECKE, Naval Research Laboratory, Washington, District of Columbia 20375, USA — Electron spin qubits based on nitrogen-vacancy centers in diamond and defects in silicon carbide have become a rapidly developing direction in quantum information and computing due to their potential in room temperature quantum computing. While single-qubit manipulations have been proposed and experimentally realized, the design of a realistic deterministic two-qubit entangling gate currently remains an important challenge. We propose fast optically controlled design where a two-qubit gate between spatially separate qubits is mediated by a photonic microcavity mode. The proposed gate scheme is compatible with available single-qubit operations. In addition, our design provides an opportunity to perform individual single qubit operations without the need to spatially resolve the qubits. As a result, for the first time a universal set of deterministic gates is proposed that can be implemented with current experimental capabilities in these systems.

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