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Quantum gates between capacitively coupled double quantum dot two-spin qubits GUIDO BURKARD, DIMITRIJE STEPANENKO, University of Basel — We study the two-qubit controlled-not gate operating on qubits encoded in the spin state of a pair of electrons in a double quantum dot. We assume that the electrons can tunnel between the two quantum dots encoding a single qubit, while tunneling between the quantum dots that belong to different qubits is forbidden. Therefore, the two qubits interact exclusively through the direct Coulomb repulsion of the electrons. We find that entangling two-qubit gates can be performed by the electrical biasing of quantum dots and/or tuning of the tunneling matrix elements between the quantum dots within the qubits. The entangling interaction can be controlled by tuning the bias through the resonance between the singly-occupied and doubly-occupied singlet ground states of a double quantum dot.

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