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Quantum error prevention and leakage elimination for quantum dots SAEED PEGAHAN, PhD Student, Southern Illinois University Carbondale, MARK S. BYRD, Professor, Southern Illinois University Carbondale, KARTHIK REDDY CHINNI, Student, Southern Illinois University Carbondale — Decoherence-free, or noiseless subsystems, are used to encode spin qubits in quantum dots in order to achieve universal quantum computing using only the exchange interaction. We investigate the use of dynamical decoupling controls for the purposes of eliminating leakage for a logical qubit encoded using three physical qubits. These leakage elimination operators (LEOs) can be used to eliminate all leakage errors using exchange interactions between the physical spin qubits. Depending on the encoding and the decoupling control, different types of errors can be eliminated. We show several different possible controls and the consequential noise reduction for different encodings as well as our general method for determining the effectiveness of these pulses.

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