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³¹P nuclear spin qubits in a ²⁸Si nanowire: a scalable unit for quantum computation

ABSTRACT. A new method of quantum information processing is suggested based on precise placing of ³¹P atoms in a quasi one-dimensional ²⁸Si nanowire using isotope engineering and neutron transmutation doping of the grown structures. The interqubit coupling is proposed to be based on the indirect interaction of ³¹P nuclear spins with electrons localized in a nanowire, which allows control of the coupling between distant qubits and even between qubits separated by non-qubit nodes. Numerical estimations show the feasibility of the proposed device.

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