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Spin communications under optimized external electric field in strained group IV semiconductors[1] LAN QING, HANAN DERY, Department of Physics and Astronomy, University of Rochester, Rochester, New York 14627 —
We investigate factors affecting an on-chip communication paradigm that is based on modulating spin polarization of a constant current in silicon or germanium wires. Strain that quenches certain intervalley scattering can prolong the spin lifetime considerably. Necessary external electric field can accelerate the transport by increasing drift velocity, yet it also enhances the spin relaxation by heating the electrons. We predict non-monotonic behaviors of the final spin signals versus the external electric fields. Simple approximate expressions are provided for the spin lifetimes of drifting electrons in strained silicon and germanium, which enable us to choose electric fields that maximize the signals in spin transport. Even at room temperature, we can expect no significant loss of the spin signal after transport across millimeter scale. Our theoretical results are supported by recent experimental breakthroughs.

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