

Abstract Submitted
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Enhanced spin-flip transport in a quantum dot spin-valve with uniform hyperfine coupling STEFANO CHESI, WILLIAM A. COISH, McGill University — We study the transport current and nuclear spin polarization dynamics in a quantum dot spin-valve, for which a strong enhancement of the spin-flip electron tunneling rates can be realized in the limit of uniform hyperfine interaction. We extend the analogy of transport to superradiance, directly applicable to a spin valve with half-metal leads and a maximally polarized nuclear system, to the more general situation of ferromagnetic contacts and a nuclear system initially fully dephased and partially polarized, as naturally realized at finite bias under stationary conditions. An analytic treatment of the dynamics in terms of simple rate equations becomes possible for very fast/slow nuclear dephasing. We recover these limiting results, as well as analyze the crossover regime, from a general master equation for the nuclear dynamics. We also present strategies to approach the limit of uniform hyperfine interaction in realistic heterostructures.

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