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Numerical study of spin-dependent transition rates within pairs of dipolar and exchange coupled spins with (s=1/2) during magnetic resonant excitation[1] MARK LIMES, JINQI WANG, WILLIAM BAKER, SANG-YUN LEE, BRIAN SAAM, CHRISTOPH BOEHME, University of Utah — The effect of dipolar and exchange interactions within pairs of paramagnetic electronic states on Pauli-blockade-controlled spin-dependent transport and recombination rates during magnetic resonant spin excitation is studied numerically using the superoperator Liouville-space formalism. The simulations reveal that spin-Rabi nutation induced by magnetic resonance can control transition rates which can be observed experimentally by pulsed electrically (pEDMR) and pulsed optically (pODMR) detected magnetic resonance spectroscopies. When the dipolar coupling exceeds the difference of the pair partners' Zeeman energies, several nutation frequency components can be observed, the most pronounced at $\sqrt{2}\gamma B_1$ (γ is the gyromagnetic ratio, B_1 is the excitation field). Exchange coupling does not significantly affect this nutation component; however, it does strongly influence a low-frequency component $< \gamma B_1$. Thus, pEDMR/pODMR allow the simultaneous identification of exchange and dipolar interaction strengths.

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