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Spin Sorting: Apparent Longitudinal Relaxation without Spin Transitions MARK CONRADI, YULIN CHANG, JASON WOODS, SUSAN CONRADI, Washington University, DEPARTMENT OF PHYSICS TEAM — Nuclear spins experience forces in the presence of a magnetic field gradient. The forces cause the spin-up and spin-down nuclei to move in opposite directions, resulting in a flow of longitudinal magnetization. The effect can generate local longitudinal spin magnetization, though it does not involve transitions (flipping) of spins. This phenomenon, spin sorting, competes with true spin-lattice relaxation and is generally not observable when T_1 is short. We present our calculations of the longitudinal magnetization of diffusing spins with long T_1 (^{3}He) in magnetic field gradients and compare the calculations with experimental results. We show that the longitudinal spin magnetization due to spin sorting can be dominant at short times in such a system. We also show how this phenomenon can potentially be used to generate nuclear magnetizations larger than thermal equilibrium.

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