The Nuclear Spin Relaxation in the Semiconductor Double Quantum Dots: Study of Spin Diffusion EDDY YUSUF, XUEDONG HU, Physics Department, University at Buffalo, SUNY, Buffalo 14260 — We study the relaxation of the nuclear spins in a semiconductor double quantum dot. We focus on spin diffusion as an important channel for nuclear spin relaxation. The diffusion of the nuclear spin polarization arises from the Fermi contact hyperfine interaction between electrons in the quantum dots and the nuclear spins, as well as the magnetic dipolar interaction between nuclear spins. We calculate the nuclear spin polarization relaxation time and the nuclear diffusion constant within the density matrix framework. We explore the behavior of the relaxation time and diffusion constant for a wide range of conditions, including variations in temperature, the initial degree of nuclear polarization, dot sizes, and the strength of the applied magnetic field. We compare our results to the available experimental data and discuss various experimental schemes to further test the outcome of our calculation. [1] A. Greilich, et al., Science 317, 1896 (2007) [2] S. Das Sarma, et. al., Solid State Commun. 133, 737 (2005)

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