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The Hyperfine-mediated and Nuclear-Dipolar-Induced Nuclear Spin EDDY YUSUF, XUEDONG HU, Physics Department, University at Buffalo — We study nuclear spin diffusion in semiconductor quantum dots based on the density matrix approach. The nuclear spin interactions that we consider include both hyperfine-mediated and magnetic dipolar interactions. Furthermore, we take into account both the secular and the non-secular terms of the magnetic dipolar nuclear interactions. We discuss how the one- and two-electronic states in the quantum dots lead to quantitatively different nuclear spin polarization relaxation and nuclear spin diffusion time. We explore the behavior of the relaxation time and diffusion constant for various experimentally relevant parameters, and compare our results to the recently measured nuclear spin relaxation in GaAs double quantum dots [1].

[1] D. J. Reilly, J. M. Taylor, J. R. Petta, C. M. Marcus, M. P. Hanson, and A. C. Gossard, arXiv:0803.3082

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