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Theoretical study of spin relaxation in a carbon nanotube quantum dot BRIAN BEZANSON, XUEDONG HU, SUNY Buffalo — Carbon nanotubes offer an attractive environment for coherent spin manipulation due to the small population of nuclear spins and weak spin-orbit interaction. While a couple of specific spin relaxation mechanisms have been investigated theoretically[1][2], there is still no comprehensive study of spin lifetimes in carbon nanotubes. In the present study we calculate the spin decay rate for electrons in gate-defined quantum dots on carbon nanotubes due to the spin-orbit and electron-phonon interactions. More specifically, we explore effects of magnetic field strength and orientation, tube diameter and chirality, and confinement.

[1] Y. G. Semenov, K. W. Kim, G. J. Iafrate, Phys. Rev. B 75, 045429 (2007)

[2] K. M. Borysenko, Y. G. Semenov, K. W. Kim, J. M. Zavada, arXiv 0710.3382 (2007)

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