

Local manipulation of nuclear spin in a semiconductor quantum well

Authors: Poggio M. Steeves GM. Myers RC. Kato Y. Gossard AC. Awschalom DD.

Recommended and a commentary by Lu Sham, University of California, San Diego

How do you make spins dance? Look at interaction Hamiltonian, $gB.S$. You can control spin with a magnetic field. You take a magnetic field, chop it, dice it and make dumplings of it. Doses of it can do wonderful things to the spins. You can make an MRI with this trick but you can't put the MRI in your pocket. So Awschalom and Gossard's team in several incarnations have gone for messing with g , the gyromagnetic ratio.

They found by varying Al content in AlGaAs they could vary g and, moreover, by electric control of the electron wave function, they could vary g . So Kato et al.[1] had fun using electrical shock to make the spins dance. Then things got complicated. The electron spins are connected to the nuclear spins. So they can be led to join the dance [2]. The recommended article is then the third or fourth installment of the story.

Technologists would salivate. Experimentalists would naturally find it interesting. Why should theorists care? Ah, maybe some day soon the experimental spin dances and the theoretical spin calisthenics could be put together and lead to a deeper understanding of the many spin solids and, who knows, maybe even strongly correlated electron systems.

[1] Y. Kato, R. C. Myers, D. C. Driscoll, A. C. Gossard, J. Levy, and D. D. Awschalom, *Science*, 299, 1201 (2003).

[2] M. Poggio, G. M. Steeves, R. C. Myers, Y. Kato, A. C. Gossard, D. D. Awschalom

<http://arXiv.org/cond-mat/0304030>