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Modelling Optically Pumped NMR and Spin Polarization in AlGaAs/GaAs Quantum Wells[1] DIPTA SAHA, CHRIS STANTON, R. WOOD, C.R. BOWERS, University of Florida, E. SESTI, S.E. HAYES, Washington University, P.L. KUHNS, S.A. MCGILL, A.P. REYES, NHMFL — Optically Pumped NMR (OPNMR) is a combination of the optical pumping of semiconductors to create spin-polarized electrons and the direct detection of an enhanced NMR signal as the electron spin polarization is transferred to the nucleus. We present theoretical calculations for the average electron spin polarization at different photon energies for different values of external magnetic field in both unstrained and strained $Al_xGa_{1-x}As/GaAs$ quantum wells. Comparison is made with the experimental OPNMR signal intensity. We identify the Landau level transitions which are responsible for the peaks in the OPNMR signal intensity. Our calculations are based on the 8-band Pidgeon-Brown model generalized to include the effects of the confinement potential as well as strain. In strained wells, the strain is calculated using a relation that associates the experimental value of the nuclear quadrupole splitting with the strain along a given axis. Optical properties are calculated using Fermi's Golden rule. Results show that the strength and sign the OPNMR signal is related to the average electron spin polarization.

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Chris Stanton
University of Florida

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