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Probing the coupling between holes and nuclear spins in a 2D GaAs Hole System using a Landau level spin diode ALEX HAMILTON, OLEH KLOCHAN, University of New South Wales, Sydney, Australia, I. FARRER, D.A. RITCHIE, Cavendish Laboratory, University of Cambridge, UK — Hole spins have recently attracted significant interest due to their potential applications for quantum computing applications due to reduced coupling to the nuclear spin bath, which is the main source of decoherence in GaAs electron spin qubit systems. Here we report a study of the interaction between nuclear and hole spins in a two-dimensional hole system in the Quantum Hall regime, using the Landau level diode technique to make separate electrical contact to two edge states with different spin polarizations. Experiments on similar electron systems show hysteretic I-V traces and electrically detected nuclear magnetic resonance revealing coupling of electron and nuclear spins. For 2D hole systems however, although non-linear I-V characteristics are observed, we were unable to detect coupling between hole and nuclear spins over a wide range of hole densities, consistent with a greatly reduced hyperfine interaction.

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