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Atom-by-Atom substitution of Mn in n-type GaAs and Electron mediated Mn-Mn interaction in GaAs¹ ANTHONY RICHARDELLA, PEDRAM ROUSHAN, DALE KITCHEN, ALI YAZDANI, Princeton Nanoscale Microscopy Laboratory, Department of Physics, Princeton University — Using a novel atomic scale manipulation technique with a cryogenic scanning tunneling microscope (STM), we have recently demonstrated the ability to incorporate single Mn atoms in p-GaAs substrates and have used this technique to visualize hole-mediated interaction between Mn acceptors in p-type GaAs. [1] We will report on the extension of these experiments to n-type substrates, for which we have also succeeded in incorporation of single Mn acceptors and probed Mn-induced in-gap states using spatially resolved STM spectroscopy. In contrast to previous work, experiments on n-type substrates allow us to explore spin-spin interaction between Mn mediated by electrons in the valance band. Imaging and spectroscopic mapping show Friedel oscillation in the vicinity of individual Mn dopants. We will report these results and more recent experiments on the role of such oscillation on the interaction between Mn-dopants. [1] D. Kitchen, A. Richardella, J-M. Tang, M. Flatte, A. Yazdani, Nature 442, 436–439 (2006).

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