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Tunable control over the ionization state of single Mn acceptors in GaAs with defect-induced band bending[1] DONGHUN LEE, JAY GUPTA, Dept. of Physics, Ohio State University — The continuous miniaturization of semiconductor devices will ultimately reach a point where control over the properties of single dopants is necessary. Recent STM studies have demonstrated the ability to control the ionization state of single dopants through tip-induced band bending. This change in ionization state appears in STM images as a ring-like feature centered on the dopant, whose diameter depends on voltage, tip-sample distance, and tip termination. Here we demonstrate an additional degree of freedom for controlling the charge state of single Mn acceptors in GaAs by utilizing nearby charged defects which can be positioned with atomic precision. Systematic changes in the ring diameter with the separation between Mn and defect allows us to separately extract contributions from defect-induced and tip-induced band bending. These methods provide non-volatile control over the ionization state of single dopants, even in the absence of probe electrodes or STM tip.

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