

Abstract Submitted
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Scanning probe study of dopant charging in a semiconductor heterostructure¹ IRMA KULJANISHVILI, CEMIL KAYIS, JAMES HARRISON, CARLO PIERMAROCCHI, THOMAS KAPLAN, STUART TESSMER, Michigan State University, LOREN PFEIFFER, KEN WEST, Bell Laboratories, Lucent Technologies — The smallest possible semiconductor nano device is a single dopant atom. The properties of such a structure are most prominent at low temperature, where multiple electrons or holes can be localized at the parent donor or acceptor. Using a scanning probe method, we study dopant atom charging in an AlGaAs/GaAs heterostructure with a delta-doped Si layer. The method is based on the Scanning Charge Accumulation (SCA) imaging technique that allows for studying a subsurface electronic system. Here we report on our results resolving the single-electron addition spectra of small numbers of dopant atoms. These highly localized capacitance measurements are contrasted to gated capacitance measurements. The SCA data are compared to a simple model based on a donor-molecule picture.

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