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Charge Switching of Donor Ensembles in a Semiconductor[1]
RAINER G. ULBRICH, KARIN TEICHMANN, MARTIN WENDEROTH, Physics Faculty, Goettingen University, SEBASTIAN LOTH, IBM Research Division, Almaden Research Center, San Jose, A.P. WIJNHEIJMER, J.K. GARLEFF, P.M. KOENRAAD, Department of Applied Physics, Eindhoven University of Technology, The Netherlands — We report charge switching of well-defined groups of individual donors in GaAs controlled by a scanning tunneling tip with atomic resolution [1,2]. Lateral positioning and voltage tuning of the band-bended region under the sharp tip allows to measure at low temperature, T = 5 K, the ionization threshold of each given donor site with high precision. The changing charge states of surrounding donors give rise to discrete "Coulomb ladder" steps in the screened electrostatic potential V(r) which is extracted for the nearest donor under the tip. In certain geometrical configurations we observe bias- and time-dependent flicker spectra.

[1] K.Teichmann et al., PRL 101, 076103 (2008)
[2] A.P.Wijnheijmer et al., PRL 102, 166101 (2009)

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