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Title:Electrostatic effects in coupled quantum dot-point contact-single electron transistor devices
Authors:Pelling, S. (1); Otto, E. (2); Spasov, S. (1); Kubatkin, S. (2); Shaikhaidarov, R. (1); Ueda, K. (3); Komiyama, S. (3); Antonov, V.N. (1)
Author affiliation:(1) Physics Department, Royal Holloway University of London, Egham, Surrey TW20 0EX, United Kingdom; (2) Department of Microtechnology and Nanoscience (MC2), Chalmers University of Technology, S-41296 Göteborg, Sweden; (3) Department of Basic Science, University of Tokyo, Komaba 3-8-1, Meguro-ku, Tokyo 153-8902, Japan
Corresponding author:Antonov, V.N.(v.antonov@rhul.ac.uk)
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Abstract:We study the operation of a system where quantum dot (QD) and point contact (PC) defined in a two-dimensional electron gas of a high-mobility GaAs/AlGaAs heterostructure are capacitively coupled to each other and to metallic single electron transistor (SET). The charge state of the quantum dot can be probed by the point contact or single electron transistor. These can be used for sensitive detection of terahertz radiation. In this work, we explore an electrostatic model of the system. From the model, we determine the sensitivity of the point contact and the single electron transistor to the charge excitation of the quantum dot. Nearly periodic oscillations of the point contact conductance are observed in the vicinity of pinch-off voltage. They can be attributed to Coulomb blockade effect in a quasi-1D channel because of unintentional formation of small quantum dot. The latter can be a result of fluctuations in GaAs quantum well thickness. © 2012 American Institute of Physics.
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