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New scenario of shuttling mechanism in magnetic nano-electromechanical single-electron tunneling systems HEE CHUL PARK, School of Computational Science, Korea Institute for Advanced Study, ANATOLI M. KADIGROBOV, ROBERT I. SHEKHTER, MATS JONSON, Department of Physics, University of Gothenburg — We investigate a new shuttling scenario in the electro-mechanics of a movable quantum dot between a nonmagnetic lead and a magnetic lead. In this device, the quantum dot has two energy levels due to the Zeeman energy splitting under magnetic field with Coulomb blockade. The electromechanical instability is shown to depend on the external voltage when the vibrating energy overcomes the dissipation energy of the system. In addition to the normal shuttling behavior, the shuttling current can be suppressed and then recovered depending on the external voltage. It is also found that the nano-electromechanical oscillation significantly improves the spin polarized current compared with one in the fixed quantum dot due to the interplay between the spin polarized transport and mechanical degree of freedom.

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