

Abstract Submitted
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A theory on the self-sustained current oscillations in spin-blockaded quantum dots¹ XIANGRONG WANG, BIN HU, The Hong Kong University of Science and Technology — Based on the experimental fact that the self-sustained current oscillations (SSCO) in spin-blockaded double quantum dots is closely associated with the dynamically polarized nuclear spins, we consider the possible scenario that the SSCO in the spin-blockaded double quantum dots is the manifestation of the periodic motion of dynamical nuclear spin polarization (along a limit cycle) under an external magnetic field and a spin-transfer torque. Based on the Landau-Lifshitz-Gilbert equation, it is shown that a sequence of semistable limit cycle, Hopf, and homoclinic bifurcations occur as the external field is tuned. Although the fundamental time scale is nanoseconds for electron tunneling and microseconds for nuclear spin dynamics under the external field or Overhauser fields, the divergent period near the homoclinic bifurcation explains well why the period in experiments can be many orders of magnitude longer than all microscopic time scales. Some predictions associate with the theory may also be tested experimentally.

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Xiangrong Wang
The Hong Kong University of Science and Technology

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