Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Self-consistent Perturbation Theory for Non-equilibrium Steady State for Nonlinear Drift Force CHULAN KWON, Myongji University, PING AO, DAVID THOULESS, University of Washington — We investigate the properties of non-equilibrium steady state for nonlinear drift force. We find that drift force can be decomposed into three parts. The two parts are also present for linear drift force; one is responsible for local detailed balance with diffusive motion due to noise and the other gives cyclic probability current around equiprobability surface. The new part gives residual probability current and may yield the shift of probability maximum from fixed point, that is a novel effect caused by the combination of high-dimensional noise and nonlinear drift force. Since nonlinear case is not exactly solvable, we use the perturbation theory where drift force is expanded up to the quartic order about fixed point. The first order perturbation theory shows the existence of residual current and the shift of probability maximum from fixed point, which also shows a good agreement with simulation.

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Date submitted: 30 Nov 2009 Electronic form version 1.4