Stochastic pump of interacting particles

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Abstract:

We consider overall directed motion of repulsively interacting Brownian particles under the influence of unbiased pumping forces that vanish under spatial or temporal averaging. For one dimensional motion analytic results are obtained, showing particle-hole symmetry, and current reversal with changing density.

For two-dimensional colloids under a flashing ratchet drive, molecular dynamics simulations reveal a different density dependence of current from the results obtained in one dimension, and the resonance frequency show a non-monotonic variation with density. We use mean field arguments to describe these results. We further show how the change in dynamic behavior is associated with structural transformation in the colloidal dispersion.