



Experimental demonstration of a dusty plasma ratchet

rectification and its reversal

Ya-feng He^{1*}, Bao-quan Ai^{2*}, Chao-xing Dai¹, Chao Song¹, Rui-qi Wang¹, Wen-tao Sun¹, Fu-cheng Liu¹, and Yan Feng^{3*}

¹Hebei Key Laboratory of Optic-electronic Information Materials, College of Physics Science and Technology, Hebei University, Baoding 071002, China

²Guangdong Key Laboratory of Quantum Engineering and Quantum Materials, SPTE, South China Normal University, Guangzhou 510006, China

³Center for Soft Condensed Matter Physics and Interdisciplinary Research, School of Physical Science and Technology, Soochow University, Suzhou 215006, China.

The naturally persistent flow of hundreds of dust particles is experimentally achieved in a dusty plasma system with the asymmetric sawteeth of gears on the electrode. It is also demonstrated that the direction of the dust particle flow can be controlled by changing the plasma conditions of the gas pressure or the plasma power. Numerical simulations of dust particles with the ion drag inside the asymmetric sawteeth verify the experimental observations of the flow rectification of dust particles. Both experiments and simulations suggest that the asymmetric potential and the collective effect are the two keys in this dusty plasma ratchet. With the nonequilibrium ion drag, the dust flow along the asymmetric orientation of this electric potential of the ratchet can be reversed by changing the balance height of dust particles using different plasma conditions.

References

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