

Abstract Submitted  
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**Mesoscopic Transport with Ultracold Atoms** KUNAL DAS, Kutztown University of Pennsylvania, SETH AUBIN, College of William and Mary — We propose an experimental scheme to simulate mesoscopic transport experiments with ultracold atoms on microtraps that would allow study of transport features not easily available in solid state electron-based systems, including, the effects of quantum statistics and the nonlinear effects of interactions of variable strengths. We illustrate with an application to a transport phenomenon called quantum pumping, a subject of much theoretical study in the context of solid state mesoscopic systems, but with no concrete and unambiguous experimental demonstration. We show that it can be implemented with cold atoms in a microchip with greater facility. Tests of this mechanism have strong applications value leading to improved control for charge and spin currents in nano-circuits. In addition, it has fundamental science implications since quantum pumps display geometric behavior, resonance transmission features, and in certain cases operate purely by quantum interference.

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