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Electron turbulence in nanoscale junctions NEIL BUSHONG, University of California, San Diego, JOHN GAMBLE, The College of Wooster, MASSIMILIANO DI VENTRA, University of California, San Diego — Electron transport through a nanostructure can be characterized in part using concepts from classical fluid dynamics. [1] It is then natural to ask how far the analogy can be taken, and whether the electron liquid can exhibit nonlinear dynamical effects such as turbulence. Here we present a first-principles study using time-dependent current density functional theory of electron transport in nanojunctions which reveals that the electron liquid indeed exhibits behavior quite similar to that of a classical fluid. For example, a transition away from symmetric flow occurs at higher current densities, just as in the classical Navier-Stokes case. We will also discuss the behavior of the velocity correlation tensor in both laminar and turbulent regimes, as well as spontaneous symmetry breaking. Work supported in part by NSF and DOE.

[1] R. D'Agosta and M. Di Ventra, J. Phys. Cond. Matt. in press.

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