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Van der Waals quantum friction and fluctuation theorems DIEGO DALVIT, Los Alamos National Laboratory, FRANCESCO INTRAVAIA, Humboldt-Universitaet zu Berlin, Germany, RYAN BEHUNIN, Department of Applied Physics, Yale University — We use general concepts of statistical mechanics to compute the quantum frictional force on an atom moving at constant velocity above a planar surface. We derive the zero-temperature frictional force using a non-equilibrium fluctuation-dissipation relation, and show that in the large-time, steady-state regime quantum friction scales as the cubic power of the atom's velocity. We also discuss how approaches based on Wigner-Weisskopf and quantum regression approximations fail to predict the correct steady-state zero temperature frictional force, mainly due to the low frequency nature of quantum friction.

Diego Dalvit
Los Alamos National Laboratory

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