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Directed polymer liquids addressed via the two-dimensional one-component plasma: Developing the framework ANTON SOUSLOV, Georgia Institute of Technology, D. ZEB ROCKLIN, University of Illinois at Urbana-Champaign, PAUL M. GOLDBART, Georgia Institute of Technology — The distribution of *small* density fluctuations in a directed polymer liquid is characterized by the equilibrium structure factor. By contrast, the distribution of *large* density fluctuations embodies new information about the polymer state. Physically, large density fluctuations are closely related to particle inclusions, i.e., compact regions from which polymers are excluded. The highly correlated nature of directed polymer liquids complicates a single-chain approach to such issues and, instead, we invoke a quantum many-body technique to map the three-dimensional polymer system to a two-dimensional hard-core Bose fluid. Then, by using Chern-Simons field theory, we make the standard transformation of this Bose fluid into a system of non-interacting fermions that fill a single Landau level. The density distribution of these fermions is that of a classical two-dimensional one-component plasma (2DOCP), whose properties are well understood; we invoke them to obtain the entropy cost of particle inclusions in the polymer liquid. Along the way, we examine the validity of the various approximations that have been made.

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