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Linear Electrostatic Instabilities in a Quantum Plasma with Arbitrary Level of Degeneracy SHANE RIGHTLEY, DMITRI UZDENSKY, CIPS, University of Colorado — In this study, a fully kinetic complex solution of the linear dispersion relation for electrostatic waves in a quantum electron plasma with arbitrarily-degenerate Fermi-Dirac equilibrium distribution is extended to cases with multiple drifting populations of electrons. Building on a previous numerical procedure, we allow for a full linear analysis of quantum kinetic effects in one-dimensional streaming instabilities. The bump-on-tail instability is analyzed for an arbitrarily degenerate electron background. Additional focus is on instabilities in systems with counter-streaming populations with varying degrees of degeneracy. These instabilities have been previously studied analytically in some simple cases. This presentation discusses specifically the kinetic effects on these instabilities, which are of well-known importance to classical plasmas. Additionally, our use of a physically realistic Fermi-Dirac distribution function is novel. The intent of the analysis is towards increasing the understanding of quantum plasma physics as a field and laying a foundation for further studies.

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