

Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Reconciling Landau and van Kampen-Case: the Suppression of Decaying Discrete Modes¹ FRANK LEE, BRADLEY SHADWICK, University of Nebraska - Lincoln — The solution by Landau of the one-dimensional linear Vlasov equation, which describes a collisionless plasma, shifts and deforms the Bromwich contour around the poles of the analytically-continued dielectric function. For an unstable equilibrium with growing and decaying normal modes, this procedure results in only the growing modes contributing. However, the van Kampen-Case solution shows that the eigenfunctions of the decaying discrete modes always accompany those of the growing discrete modes, and thus a contradiction seems to arise, since both Landau and van Kampen-Case give valid solutions. In order to reconcile the two seemingly different answers, we present a solution that is equivalent to both and show that the decaying discrete modes do not actually exist; a part of the van Kampen continuum seems to always conspire to exactly cancel the decaying discrete modes. Our solution evaluates the Bromwich integral using properties of Cauchy-type integrals instead of deforming the contour, avoiding the analytic continuation from the Landau method. It also avoids the complicated principal value integrals from the van Kampen-Case method; only a straightforward Laurent series expansion is required.

¹Work supported by the US DoE under contract DE-SC0018363

Frank Lee
University of Nebraska - Lincoln

Date submitted: 01 Jul 2020

Electronic form version 1.4