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Particle signature of linear Landau damping

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Landau damping of waves is generally reputed to be due to resonant particles, i.e. to particles with velocities equal -or close to- their phase velocity. On the other hand, in the linear version of Landau damping, the number of resonant particles must be assumed infinitely small. To make clear this apparent contradiction, numerical simulations should allow evidencing the roles of the different classes of particles, resonant, passing, and close to resonance. As numerical noise can blur the results and make difficult their interpretation, the choice of the numerical technique is crucial. The results of a perturbative PIC simulation are presented in the companion paper by Mottez et al. In the present talk, we will present the theory and show what results are to be expected. Must the perturbation df(v) of the distribution function be localized around the resonant velocity, in which way, Ě? All the answers can be derived from the original Fourier-Laplace treatment of Landau damping, but the calculation is not easy so that it is actually difficult to make one's own intuitive guess on these questions. We will show that the Van Kampen approach can provide a relatively fast way to get results that are physically understandable and directly comparable to numerical results.