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Numerical and analytical study of nonlinear Landau damping NIKOLAI YAMPOLSKY, NATHANIEL J. FISCH, PPPL — Nonlinear interaction of a plasma wave with resonant particles is essential classical problem in plasma physics. Studying of its nature has been performed for almost fifty years and resulted with a number of models. Most of these models are complicated and it is hard to apply them to solve particular problems. New simplified model of quasi-linear saturation of Landau damping of growing in time plasma wave is proposed. This model describes interaction in terms of fluid equations on the wave amplitude and several low-order coefficients of Taylor expansion of the distribution function within trapped region. These parameters allow determining both nonlinear Landau damping rate and nonlinear frequency shift of the plasma wave due to its interaction with trapped particles. Proposed model is verified with PIC simulations using XES1 code. The results of the numerical experiment are in reasonable agreement with analytical. This work was supported by DOE Contracts No. AC02-76CH0-3073 and DE-FG52-04NA00139.

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