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Phenomenological theory of the kink instability in a slender plasma column D.D. RYUTOV, LLNL, Livermore, CA 94551, I. FURNO, T.P. INTRATOR, S. ABBATE, T. MADZIWA-NUSSINOV, LANL, Los Alamos, NM 87545 — When one deals with a plasma column whose radius a is much smaller than its length L, one can think of it as of a thin filament whose kink instability can be adequately described simply by a 2D displacement vector, x=x(z,t); y=y(z,t). Details of the internal structure of the column such as the current, density, and axial flow velocity distribution would be lumped into some phenomenological parameters. This approach is particularly efficient in the problems with non-ideal (sheath) boundary conditions at the end electrodes, the finite plasma resistivity, and the case of a substantial axial flow. For the non-ideal situation, we find instability in the domain well below the classical Kruskal-Shafranov limit. The presence of an axial flow causes the onset of a rotation of the kink and strong axial "skewness" of the eigenfunction. We consider the limitations of the phenomenological approach and find that they are related to the steepness with which the plasma resistivity increases at the plasma boundary with vacuum. Work performed for US DOE by UC LLNL under contract #W-7405-Eng-48.

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