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Parametric analysis of the two-fluid, resistive tearing instability[1]

E. AHEDO, Universidad Politecnica de Madrid, J.J. RAMOS, M.I.T. Plasma Science and Fusion Center — A two-fluid analysis of the resistive tearing instability is presented. It concentrates on the systematic investigation of the physics related to the contributions of the Hall term and the electron pressure gradient to the electric field, for arbitrary values of the ion skin depth and of the magnitude of the magnetic guide field. The plasma compressibility is treated consistently for a wide range of the plasma beta that excludes only the extremely cold limit when the mode growth rate becomes supersonic. Conversely, the effects associated with the electron inertia, the finite ion gyroradius and the equilibrium density and temperature gradients are neglected. Seven parametric regions are identified, characterized by the relative strengths of the Hall and beta parameters. Five of them are amenable to asymptotic analyses yielding analytic dispersion relations and one allows a semi-analytic treatment. The singular, multi-layer structure of the tearing mode and the conditions under which the different components of the magnetic field diffuse resistively are shown in detail for each of those parametric regions.

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