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Nonlinearly unstable interchange modes in transverse magnetic field JUPITER BAGAIPO, ADIL HASSAM, PARVEZ GUZDAR, University of Maryland - College Park — The nonlinear stability of the ideal magnetohydrodynamic interchange mode for plasma immersed in a constant transverse magnetic field near marginal conditions is studied. We use reduced equations for a strong axial field to find an analytic solution for the nonlinear behaviour as a function of the deviation from marginality. The study is motivated in order to assess B-field tolerances in stellarator coil design. A systematic perturbation analysis in the smallness parameter, $|b_2/B_c|^{1/2}$, is carried out, where B_c is the critical transverse magnetic field for the marginally stable ideal mode, and b_2 is the deviation from B_c. The lowest order expansion yields an eigenvalue equation for the magnitude of the critical field required for marginal stability, B_c. The calculation is carried out to third order, including nonlinear terms, and a time-evolution equation for the amplitude is found. In the short wavelength limit we find that the system is nonlinearly unstable for large enough perturbations even if $b_2/B_c > 0$ (linearly stable). This result is similar to that of Cowley and Artun[1] for the marginally stable line-tied g-mode. If the system is driven nonlinearly unstable, the resulting growt

[1]S. C. Cowley and M. Artun, Physics Reports **283**, 185 (1997).

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