Abstract Submitted
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Extended-MHD modeling of diamagnetic-drift tearing instabilities[1] JACOB KING, SCOTT KRUGER, Tech-X Corporation — We use analytics and computations with the NIMROD code to examine tearing stability in large-guide-field slab cases with a nonzero equilibrium pressure gradient. A well known result from drift-reduced MHD is the diamagnetic drift associated with the pressure gradient has a stabilizing influence were the dispersion relation becomes $(\gamma + i\omega_{*e})^3\gamma(\gamma + i\omega_{*i}) = \gamma^5_{rMHD}$ [1]. Here ω_{*i} and ω_{*e} are the ion- and electron-diamagnetic frequencies and γ_{rMHD} is the tearing growth rate with a resistive-MHD model. Preliminary computational results with an unreduced extended-MHD model do not produce the expected drift-reduced result. For moderate values of ω_{*i} ($\omega_{*i} \leq 3\gamma_{rMHD}$), the computations follow the dispersion relation that would result if the ∇p_e term were not included in the drift-reduced parallel Ohm's law: $(\gamma + i\omega_{*e})^4(\gamma + i\omega_{*i}) = \gamma^5_{rMHD}$. Analytics, guided by computational diagnostics, are used to examine the significant terms in the flux evolution equation and investigate the discrepancy with the drift-reduced result.

[1] For example Coppi, PoF 7, 1501 (1964); Biskamp, NF 18, 1059 (1978).

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Jacob King
Tech-X Corporation

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