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Bounds on the Dissipation Rate in Sheared MHD Flows

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Abstract

The total dissipation rate for MHD flows in plane geometry with both velocity and magnetic shear is studied. For some boundary conditions it is shown that the lower bound on the dissipation rate is achieved by the equivalent of Stokes flow for MHD. Using the 'background method' (Doering & Constantin, Phys. Rev. Lett. **69**, 1648–1651 (1992)) upper bounds for the dissipation rate are calculated. For a shear layer, with both velocity and magnetic shear, parameter dependence of the upper bound is obtained. As a by-product of this calculation, an 'energy stability' domain is calculated. A sheet pinch is also studied, and it is shown that the upper bound tends to zero as the resistivity tends to zero. Thus, an antiturbulence result is obtained. (Additional results are given in the poster by Alexandros et al.)

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