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Fast Magnetic Reconnection Catalyzed by Trapped Electrons in Space and Laboratory Plasmas.[1] N. KATZ, J. EGEDAL, W. FOX, M. PORKOLAB, Plasma Science Fusion Center, Massachusetts Insitute of Technology — The experimental studies in the open cusp configuration of the Versatile Toroidal Facility at MIT [1] have revealed a new paradigm for magnetic reconnection. Here the reconnection process is controlled and catalyzed by the dynamics of trapped electrons. The experimental data includes a rigorous study of the size and geometry of the electron diffusion region and the anomalously small current densities observed at the X-line. The low current densities are consistent with our theoretical studies solving the Vlasov equation in the measured electric and magnetic fields. A similar kinetic analysis has been applied to a unique data set obtained during reconnection in the Earths magnetotail by the WIND spacecraft. In this latter case the reconnection process is also controlled by electrostatically trapped electrons [2].

[1] J. Egedal, et al., Rev. of Sci. Instrum. 71, 3351 (2000).

[2] J. Egedal, et al., Phys. Rev. Lett. 94, 025006 (2005).

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