

Abstract Submitted
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Experiments on 3D Onset of Magnetic Reconnection¹ N. KATZ, J. EGEDAL, W. FOX, A. LE, A. VRUBLEVSKIS, J. BONDE, M. PORKOLAB, MIT, PSFC — We study collisionless magnetic reconnection in the laboratory using the Versatile Toroidal Facility (VTF) at MIT. In our experiments a parameter regime exists where the reconnection process appears in rapid bursts [1]. This regime provides a unique opportunity to study the unresolved “trigger problem” of magnetic reconnection related to the spontaneous and explosive onset of events observed on the sun, in the Earth’s magneto-tail and in sawtooth oscillations in magnetic fusion devices. Although the reconnection is driven, fast reconnection is not seen immediately: instead, the plasma responds at first by building up current to oppose the drive, and only after a delay of $\sim 100 \mu\text{s}$ is there a burst of spontaneous, fast reconnection. We find that although the experiment is set up axi-symmetrically, the burst of reconnection starts at one toroidal location and propagates along X-line approximately at the Alfvén speed. This burst of fast reconnection is only observed in the presence of a global plasma mode ($q = 2$ or $q = 3$), which is seen both in the current density and in the floating potential and is related to the formation of a magnetic island.

[1] J. Egedal et al., Phys. Rev. Lett., **98**, 015003 (2007)

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