

Abstract for an Invited Paper
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Experimental Investigation of Spontaneous Magnetic Reconnection in the Laboratory¹

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A new experimental configuration (the Versatile Toroidal Facility, or VTF) has been in operation at MIT for the study of collisionless magnetic reconnection under controllable conditions. In this experiment a plasma parameter regime of special interest can be formed where the reconnection process appears in rapid bursts [1]. This regime provides a unique opportunity to study the scientifically unresolved “trigger problem” of magnetic reconnection in current sheets 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. The most recent experiments document how the onset phase involves three-dimensional dynamics in the laboratory: The burst of reconnection starts at one toroidal location, and then propagates around the toroidal direction at the Alfvén speed (calculated with the strength of the dominant guide field). The three dimensional measurements include the detailed time evolution of the plasma density, current density, the magnetic flux function, the electrostatic potential and the reconnection rate. In the talk Dr. Egedal will discuss the experimental methods and present detailed observations of the temporal evolution of the three dimensional dynamics associated with the fast and spontaneous onset of reconnection in the VTF current sheet.

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

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