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Experiments on 3D Evolution of Spontaneous Magnetic Reconnection[1] NOAM KATZ, JAN EGEDAL, WILL FOX, ARI LE, ARTURS VRUBLEVSKIS, MIKLOS PORKOLAB, MIT, PSFC, VTF TEAM — Magnetic reconnection is a fundamental process in plasmas that results in the often explosive release of stored magnetic energy. We study this process experimentally in the Versatile Toroidal Facility (VTF) at MIT, where we have observed 3D effects during spontaneous reconnection. A set of coils inside the vacuum chamber is used to drive reconnection. After the drive is applied, the reconnection rate remains low for about 100 μs and then a sudden burst of spontaneous fast reconnection is observed [1]. Although the experiment is toroidally symmetric, the onset and development of the spontaneous reconnection is not symmetric: we observe that it starts at one toroidal angle and then propagates around the machine in roughly 10 μs, the Alfvenic time. We explore the 3D properties of this collisionless reconnection by considering the global modes in the plasma, and the current flow patterns.
[1] J. Egedal et al, Phys. Rev. Lett. 98, 015003 (2007)

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