

Extreme ultra-violet bursts, particle heating, and whistler wave emission in fast magnetic reconnection induced by kink-driven Rayleigh-Taylor instability and measurements of forces, flows, and collimation in toroidal current channels

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We present two experimental investigations relevant to compact toroids:

1) We show experimental results observed when there is magnetic reconnection associated with a kink-driven Rayleigh-Taylor instability in a coaxial helicity injection source. The observations include i) a spatially localized energetic extreme ultra-violet (EUV) burst at the presumed position of fast magnetic reconnection associated with electron heating, ii) a circularly polarized high frequency magnetic field perturbation at some distance from the reconnection region indicating that the reconnection emits whistler waves, and iii) Doppler broadening of the plasma emission spectrum indicating ion heating.

2) We show 3D, time-dependent B-field measurements of a flared toroidal current channel. We observe significant axial  $J \times B$  forces generating near-Alfvénic flows along the axis. These flows convect poloidal flux along the axis leading to collimation of the loop structure.