

Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Magnetic Reconnection Processes Involving Modes Propagating in the Ion Diamagnetic Velocity Direction* P. BURATTI, ENEA, B. COPPI, MIT, G. PUCELLA, ENEA, T. ZHOU, MIT — Experiments in weakly collisional plasma regimes, (e.g. neutral beam heated plasmas in the H-regime [1]), measuring the Doppler shift associated with the plasma local rotation [1], have shown that the toroidal mode phase velocity v_{ph} in the frame with $E_r = 0$ is in the direction of the ion diamagnetic velocity. For ohmically heated plasmas, with higher collisionalities, v_{ph} in the laboratory frame is in the direction of the electron diamagnetic velocity, but plasma rotation is reversed as well, and v_{ph} , in the $E_r = 0$ frame, is in the ion diamagnetic velocity direction. Theoretically, two classes of reconnecting modes should emerge: drift-tearing modes [2] and “inductive modes” [3] that depend on the effects of a finite plasma inductivity. The former modes, with v_{ph} in the direction of the electron diamagnetic velocity, require the pre-excitation of a different kind of mode in order to become unstable in weakly collisional regimes. The second kind of modes has a growth rate associated with the relevant finite ion viscosity. A comprehensive theory is presented. *Sponsored in part by the US DOE.

[1] P. Buratti et al., Nucl. Fusion 52, 023006 (2012).

[2] B. Coppi, Phys. Fluids 8, 2273 (1965).

[3] B. Coppi, Bull. APS 45, 366 (2000).

Bruno Coppi
MIT

Date submitted: 08 Jul 2013

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