

FAST MAGNETIC RECONNECTION IN MAGNETIC CONFINED LABORATORY PLASMAS

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Present-day magnetic fusion experiments have entered low collisionality regimes, where electron inertia and electron pressure gradient terms in the generalized Ohm law play an important role. In addition, energetic ions produced by auxiliary heating and/or by fusion reactions have an important impact on the instability thresholds of resistive modes. As a case in point, we shall discuss magnetic reconnection processes occurring during so-called sawtooth relaxation oscillations that affect the density and temperature profile in the core of a tokamak plasma. As we shall see, the rapidity of the sawtooth relaxation time can be explained on the basis of electron inertia and other semi-collisional effects. Also, the threshold for the onset of sawtooth relaxations is relatively well understood. However, there are still a number of open issues that determine the dynamics of sawtooth relaxations and that will be addressed during the presentation. Important differences between magnetic reconnection in space and in laboratory plasmas will be highlighted. The main differences are related to open versus closed magnetic field line configurations and the absence of strong magnetic guide fields in some astrophysical plasma configurations of interest.