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Endogenous Magnetic Reconnection and Associated Processes of Relevance to Fusion Burning Plasmas

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The main characteristic of an endogenous magnetic reconnection process is that its driving factor lays within the layer where a drastic change of magnetic field topology occurs. This kind of process is shown to take place when a significant electron temperature gradient is present in a magnetically confined plasma and when the evolving electron temperature fluctuations are anisotropic [1]. Then [2] two classes of reconnecting modes are identified. The localized class of mode involve a reconnected field $\tilde{B}_x$ of odd parity (as a function of the radial variable), characteristic phase velocities and growth rates differently from the commonly considered reconnecting modes associated with a finite effective resistivity. The width of the reconnection layer remains significant even when large macroscopic distances are considered. In view of the fact that there are plasmas in the Universe with considerable electron thermal energy contents, the features of the considered modes can be relied upon in order to produce generation or conversion of magnetic energy and high energy particle populations through a sequence of mode-particle resonances [3]. With their excitation, these modes acquire momentum in the direction of the main magnetic field component and the main body of the plasma column should recoil in the opposite direction [4].
Endogenous modes associated with a finite electron temperature gradient are shown to be sustained by the electron temperature heating rate due to the charged reaction products in a fusion burning plasma [5]. In this case, the longitudinal thermal conductivity on selected rational magnetic surfaces [5] is decreased, relative to its collisional value, by the effects of reconnection.
The best agreement between theory and experiments concerning the onset of magnetic reconnection is (probably) represented by the theory of the resistive internal kink mode [6]. This is reconsidered for regimes where the effects of local temperature gradients are important. *Supported by the U.S. DOE.

[1] B. Coppi and B. Basu, Phys. Lett. A, 382, 400 (2018).
[2] B. Coppi, Phys. Fluids, 8, 2273 (1965).
[3] B. Coppi, B. Basu, and A. Fletcher, Nucl. Fus., 57, 7 (2017).
[4] B. Coppi, Nucl. Fus., 42, 1 (2002).
[5] B. Coppi, et al., Nucl. Fus., 55, 053011 (2015).
[6] B. Coppi, R. Galvao, R. Pellat, et al., Fiz. Plazmy, 2, 961 (1976).

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