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Role of Inertial and Inductive Modes in Magnetic Reconnection Events[1] P. BURATTI, ENEA, B. COPPI, B. BASU, MIT — Recently, an accurate analysis of the database of magnetic island rotation performed with the JET machine [1] has revealed that, in the frame of zero radial electric field, the island rotation frequency is about $0.9\omega_{di}$, where ω_{di} is the ion diamagnetic frequency. The drift-tearing mode theory of reconnection in low collisionality regimes predicts a phase velocity in the opposite direction [2] and, under strictly collisionless conditions, stability in the presence of electron temperature gradients. To explain the observations, a "mode inductivity" $L_{\|} \equiv (4\pi/c^2)S_L$ has been introduced [3] whose effects replace those of finite resistivity. This has led to a linear instability [4] with ω close to ω_{di}. The reconnection layer thickness is proportional to the inductivity [4] and the mode has a dissipative growth rate. When considering plasmas with ultrarelativistic energies, the inertial skin depth becomes significant. Thus the width of the reconnection layer can be considered as relevant to realistic theories.

[1] P. Buratti et al., 41st EPS Conference, ECA 38F, paper P1.014.
[2] B. Coppi, Phys. Fluids 8, (1965) 2273.
[3] B. Coppi, Bull. Am. Phys. Soc. 45, (2000) 366.
[4] B. Coppi, et al., Int. Fus. En. Conf. TH-P7/10.

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