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Characterization of magnetic reconnection in the high-energy-density regime B. QIAO, Z. XU, H.X. CHANG, S.Z. WU, C.T. ZHOU, X.G. WANG, X.T. HE, Peking University — Magnetic reconnection (MR), breaking and reorganizing the topology of magnetic field dramatically, is a fundamental process observed in many space, laboratory and astrophysical plasmas. In this talk, we report recent investigations on characterization of magnetic reconnection (MR) in the high-energy-density (HED) regime, where the plasma inflow is strongly driven and the total thermal pressure is larger than the magnetic pressure ($\beta > 1$). This extreme regime of MR occurs frequently in astrophysics and recent HED experiments. Comparing the particle-in-cell simulation results for the interactions of colliding laser-produced plasma bubbles with induced anti-parallel and parallel poloidal magnetic fields respectively, the consequences caused by MR are distinguished from those by plasma bubble collisions and two-fluid effects. It is found that the out-of-plane quadrupole magnetic field, bipolar poloidal electric field, plasma heating and even the out-of-plane electric field appear in both cases, which cannot be recognized as evidences of MR here as previously thought. The Lorentz-invariant scalar quantity $D_e = \gamma_e \vec{j} \cdot (\vec{E} + \vec{v} \times \vec{B})$ [$\gamma_e = (1 - v_e^2/c^2)^{-1/2}$ is the Lorentz factor] in the electron dissipation region is proposed as the key sign of MR occurrence in the HED regime.

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