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Large-scale magnetic field generation via the Kelvin-Helmholtz instability in unmagnetized scenarios EDUARDO ALVES, THOMAS GRISMAYER, RICARDO FONSECA, LUIS SILVA, GoLP/Instituto de Plasmas e Fusao Nuclear - LA, Instituto Superior Tecnico, Portugal — Recent particle-in-cell simulations of the Kelvin-Helmholtz instability (KHI) reveal the development of a strong and large-scale DC magnetic field component at the shear interface, which is not captured by the standard linear two-fluid theory. We show that the DC magnetic field arises from electron mixing across the shear surface. The mixing process can be modeled by an electron thermal expansion in the case of a warm shear flow, and we link this picture to the case of a cold shear flow where the development of the standard cold fluid KHI produces an effective temperature that drives the electron expansion. We present a simple analytical model that describes the early evolution and saturation of the DC magnetic field. Simulations reveal a long living DC magnetic field (well into the ion time-scale) reaching equipartition values of 10ˆ-3, which are in good agreement with our estimates. Finally, we discuss the possibility of probing the KHI and associated DC magnetic field via the interaction of an intense laser pulse with overcritical targets.

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