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Large-scale magnetic field generation via the Kelvin-Helmholtz instability THOMAS GRISMAYER, EDUARDO PAULO ALVES, GoLP/IPFN - LA Instituto Superior Tecnico, RICARDO FONSECA, DCTI/ISCTE, GoLP/IPFN - LA Instituto Superior Tecnico, LUIS SILVA, GoLP/IPFN - LA Instituto Superior Tecnico — The collisionless Kelvin-Helmholtz instability (KHI) is an important candidate to generate magnetic fields in the presence of strong velocity shears, which may naturally originate in energetic matter outburst of active galactic nuclei and gamma-ray bursters. We present the first self-consistent 3D PIC simulations with Osiris of the KHI for relativistic scenarios of shearing, unmagnetized electron-proton plasmas. Simulations reveal the emergence of a strong and large-scale DC magnetic field component, which is not captured by the standard linear fluid theory. This DC component arises from a kinetic effect that is due to the thermal expansion of the electrons of one flow into the other, whereas the protons remain unperturbed due to their inertia. The electron expansion forms DC current sheets, which induce a DC magnetic field. Our results indicate that most of the electromagnetic energy developed in the KHI is stored in the DC component, reaching values of equipartition on the order of 10^{-3} in the electron time-scale.

Eduardo Alves
GoLP/IPFN - LA Instituto Superior Tecnico

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