Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Magnetic field generation via the Kelvin-Helmholtz instability EDUARDO ALVES, SAMUEL MARTINS, FREDERICO FIÚZA, RICARDO FONSECA, LUÍS SILVA, GoLP/IPFN - LA Instituto Superior Tecnico — Collisionless plasma instabilities have been proposed as candidates to explain the origin of magnetic fields required by models for non-thermal radiation emission in GRBs. Since these extreme scenarios are usually associated with strain and rapid variability of the ejecta, it is likely that strong velocity shears are present, triggering the collisionless Kelvin-Helmholtz instability (KHI). Seed magnetic fields, generated at the early development of the KHI, can be amplified by the dynamo effect in KHI-induced turbulence. In this work we generalize the relativistic collisionless KHI calculations to include arbitrary density jumps/flows. We observe that the onset of the KHI is robust to density jumps, making this instability ubiquitous in astrophysical scenarios. We present the first fully kinetic 3D simulation of a KHI scenario, which reveals the transverse dynamics of the KHI. Both structure formation and underlying physical processes are discussed. We also present a detailed comparison between the KHI in scenarios with electron-positron and with electron-proton clouds.

Eduardo Alves
GoLP/IPFN - LA Instituto Superior Tecnico

Date submitted: 23 Jul 2010 Electronic form version 1.4