Numerical study of ultra-relativistic electromagnetic filamentation in boosted frames S.F. MARTINS, IST - Lisbon, R.A. FONSECA, ISCTE - Lisbon, IST - Lisbon, W.B. MORI, UCLA, L.O. SILVA, IST - Lisbon — We address the simulation of relativistic shocks in astrophysics, namely the numerical implications of ultra-relativistic particles and the large time/space scales associated with these systems. It was recently shown [1] that performing simulations in optimized Lorentz frames can decrease simulation run times by orders of magnitude, completely changing computational resources required. The Lorentz transformation for a boosted frame was implemented in osiris 2.0 [2] and encompassed several difficulties that will be discussed. For instance, transformation of quantities back to the laboratory frame may require massive data handling and complex diagnostic/visualization, and can cancel the potential gains from the time scale reduction due to the boost. The possibility of using a boosted frame to suppress numerical noise (e.g. due to numerical Cerenkov radiation) will also be explored.
[1] J.-L. Vay, PRL 98, 130405 (2007)
[2] R. A. Fonseca et al, Lecture Notes in Computer Science 2329, III-342 (Springer-Verlag, 2002)

Luis Silva
IST, Lisbon