Abstract Submitted
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Fireball beam formation and magnetization via plasma microinstabilities from first principles[1] BERTRAND MARTINEZ, THOMAS GRISMAYER, LUIS O. SILVA, GoLP/Instituto de Plasmas e Fuso Nuclear, Instituto Superior Tcnico, Universidade de Lisboa, 1049-001 Lisbon, Portugal — Gamma Ray Bursts represent the most intense sources of hard photons ever observed by astronomers. They involve the explosion of a stellar mass object, which energy is expelled in the form of a hot and expanding fireball beam. At large radius, the latter becomes optically thin to hard photons, thus enabling the propagation of gamma ray flashes in the Circum Burst Medium. The self-consistent interaction of these gamma ray bursts with a background plasma is still an unsolved issue, in particular how they transfer energy to it. For the first time, we focus on the self-consistent interaction of an intense gamma ray source with a background pair plasma. We performed first-principles simulations with the code Osiris, recently enriched with a module to account for Compton scattering. We prove that an intense flash of gamma rays travelling in a pair plasma can create a fireball. The latter is self-sustained by the incident gamma rays, and continuously filaments, self-consistently generating small scale B field over the depletion length of the beam.

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