

Interaction of a “Fireball Beam” with a Plasma

P. Muggli¹, S. Martins², and L.O. Silva²

¹*University of Southern California, Los Angeles, CA 90089, USA*

²*GoLP/Instituto de Plasmas e Fusao Nuclear, Instituto Superior Técnico*

In astrophysical events, the interaction of relativistic neutral plasmas with ambient plasmas could be at the origin of shock formation, and the source of magnetic fields and high-energy radiation. An ultra-relativistic neutral beam of electrons and positrons or "fireball beam" will soon become available at the SLAC National Accelerator Laboratory. Numerical simulation results show that, when sent into a neutral plasma with a density in the $10^{17}/\text{cc}$ range, the Weibel instability develops and leads to the filamentation of the beam after only 10cm. The filamentation of the beam creates strong plasma density modulations and large magnetic fields associated with the filaments, as well as excess radiation. We explore the possibility of observing the occurrence of the instability in an experiment. The generation of the "fireball beam", experimental parameters, as well as possible diagnostics will be presented

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