POLAR Project: latest experimental results and prospects

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March 22, 2012

Abstract

Considering modern high energy density facilities, bringing up matter to extreme states of density, temperature and velocity relevant to astrophysics is reproducibly achievable. New similarity experiments in the POLAR Project take advantage of this opportunity to study the formation and dynamics of accretion shocks as found in magnetic cataclysmic variables, also called polars. Rigorous scaling laws proved that relevant regime could be reached. At the astrophysical scale, the system we consider is a column of infalling plasma on the surface of a white dwarf. This column is collimated by the magnetic field of the

compact star. As matter hits the surface with supersonic velocity, a shock appears at the basis of the column and propagates upstream. In laboratory, a flow of plasma is produced using laser-matter interaction, a tube collimates it and an obstacle of quartz mimics the surface of the white dwarf. We have recently tested the experimental concept and first results are promising. The target design is currently improved, for example we try to increase the mass of material available for the reverse shock to propagate through. Latest results from the experiment will be presented along with numerical simulations.