

HD and MHD Plasma Simulations inside Discharge Capillaries with PLUTO

Simulations play a key role in the design of plasma sources, employed for plasma-based accelerators and other applications, and it is important to have alternative codes, for simulating the dynamics of the plasma. We propose an open source code, PLUTO, which allows to perform 3D, hydrodynamic (HD) and magnetohydrodynamic (MHD) simulations of gas-filled plasma discharge capillaries. We demonstrated its functionality and its versatility for testing different geometries for the capillary and parameters for the gas injection and discharge generation. Even if it lacks an ionization module, PLUTO results to be useful to analyze the behavior of the neutral gas, filling the capillary before ionization, and assess the plasma evolution after ionization, by implementing the time-dependent magnetic field created by the discharge.

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