

3D MODELING OF PARTIALLY IONIZED PLASMA INTERACTED WITH MAGNETIC FIELD¹

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Plasma physics is a vast area of physics, which includes both fundamental aspects, such as, for example, astrophysics, and more applied ones: new compact plasma accelerators, compact powerful sources of X-ray and gamma radiation, new promising, practically inexhaustible sources of clean energy due to controlled thermonuclear fusion, compact ion sources for cancer therapy and isotope sources for nuclear medicine. Currently, studies of non-stationary and non-equilibrium processes in pulsed plasma created under the influence of high-intensity energy flows on matter are topical. Energy flows of multiterawatt and petawatt power levels are created, for example, in laboratory conditions, by electric pulse generators, as well as by short-pulse laser installations.

This paper presents a hydrodynamic model that considers ions and neutrals as separate fluids that interact with each other through collisional processes. In this case, the evolution of ions is determined by the system of magnetic hydrodynamics, and of neutrals - by ordinary, non-magnetic hydrodynamics. Such an approximation makes it possible to carry out simulations and study effects in a partially ionized plasma [1,2]. The code MARPLE3D (Keldysh Institute of Applied Mathematics, Russian Academy of Sciences), developed for solving problems of magnetic radiation gas dynamics on high-performance cluster-type computing systems, was used for simulation [3].

REFERENCES

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