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SIMULATION OF PLASMA FUELING IN THE GDMT FACILITY *)

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The plasma department of BINP is working now on the design of the GDMT [1] facility, a new-generation open trap for hot plasma confinement. A distinctive feature of the GDMT facility is the long duration of the operating pulse (several seconds), which makes it possible to study the plasma in a stationary mode, under conditions of equality of flows of matter and energy introduced into the plasma and lost from the trap.

An important element of the GDMT installation is a plasma fueling system that ensures the maintenance of a constant plasma density in the trap. It is assumed that the replenishment of the substance will be carried out by gas injection in the area near the magnetic mirror, where the plasma has the smallest diameter. At the same time, thermal molecules, due to their low velocity, cannot penetrate into the axial regions of the plasma, and the fueling process is associated with the formation of fast secondary particles.

The goal of this work is to analyze the effectiveness of plasma fueling with substance. To solve this problem, a Monte-Carlo simulation program for the penetration of hydrogen molecules into plasma has been developed, taking into account the basic molecular processes with primary hydrogen molecules and fast atoms formed during charge exchange and ionization of molecules. With the help of the developed program, the spatial distribution of emerging ions was obtained and the efficiency of plasma fueling with matter was analyzed.

References

[1]. D. Skovorodin et al. Gas-Dynamic Multiple-Mirror Trap GDMT // Plasma Physics Reports. 2023. V. 49. No 9. pp 1039-1086

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