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SIMULATION OF DIFFUSION AND CONVECTION IN THE T-10 PLASMA WITH ON-AXIS ECR HEATING AFTER THE CHAMBER LITHIEZATION *)

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Experiments were carried out in the T-10 tokamak to study the plasma density pump-out effect from the ECR heating region after the chamber lithiezation of. Two quasi-stationary states were obtained with different plasma densities at the ohmic stage before the ECR heating and at the stage of ECR heating [1]. This allows us to find and compare diffusion coefficients and the pinch velocities before and after ECR heating, and to estimate the effect of heating on the anomalous transport of particles. The simulation was carried out for two series of T-10 shots ## 63332-63335 and ## 63339-63343. In both series, at t=700 ms, the on-axis ECR heating was turned on with a power of 1.1 MW in the first series and 0.55 MW in the second one. The plasma current in both series was 180 kA, and the average plasma density varied within $1.5–3.8\times10^{19}$ m^{-3}.

The numerical modeling was performed by the ASTRA code with the Transport model of canonical profiles (TMCP). Equations for electron and ion temperatures, electron density, and plasma current density were solved. When modeling the electron density profile, the average particle density along the central chord was adjusted to its experimental value that allows us to determine the source of the particles. The numerical coefficients in the expressions for the fluxes have the typical values for TMCP and do not change from shot to shot [2].

The diffusion coefficient, pinch velocity and particle source were determined for two time instants at the quasi-stationary stage of discharges: immediately before start on the ECR heating (t=700 ms) and before turning off the heating (t=900 ms).

It was shown that at the ECRH stage of the discharge, with increasing plasma density, the diffusion coefficient decreases, but remains several times higher than at the ohmic stage. At the same time, with increasing density, the particle pinch velocity decreases up to a certain critical density value, above which it begins to increase for both heating powers. This dependence of the transport coefficients can explain the fact that with increasing density, the density pump-out effect first increases up to a certain critical density value, and then begins to decrease [1]. To study this effect more accurately, we plan to analyze a larger number of shots with different parameters.

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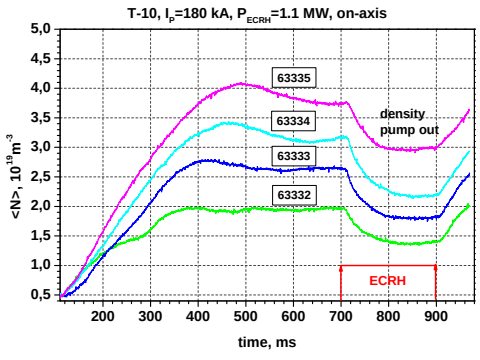

Fig. 1

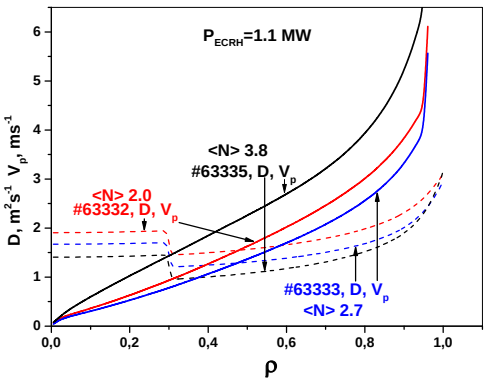

Fig. 2

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[2]. Dnestrovskij Yu.N., 2015 Self-Organization of Hot Plasmas(Switzerland: Springer)

*) abstracts of this report in Russian