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INFLUENCE OF DRIFTS AND CURRENTS ON THE MAIN DIVERTOR PARAMETERS OF T-15MD TOKAMAK *)

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The results of the first calculations of the edge plasma of the T-15MD tokamak in the SOLPS-ITER code with drifts and currents included are presented. Regimes with a power crossing the separatrix P_{SOL} = 6 MW and different intensities of hydrogen gas injection (H), corresponding to the average electron density on the separatrix, $n_{esep} = 2{\cdot}10^{19} – 4.5{\cdot}10^{19}$ m^{-3}, are considered.

Qualitatively, the effect of taking into account drifts is the same as on tokamaks of a similar size, for example, ASDEX-Upgrade. The influence of drifts decreases with increasing gas inlet and transition to detachment of the outer diverter. At lower gas inlet values, E×B drift leads to the flow of hydrogen (H) from the outer diverter to the inner one, which changes the load distribution between the divertor plates: taking into account drifts, the maximum heat flux on the inner plate is less than on the outer one. The change in electron density on the separatrix, also caused by E×B drift, leads to the fact that to achieve the same value of n_{esep}, a larger gas puff of H is required.

The distribution of carbon impurities also changes noticeably when drifts and currents are taken into account. The inclusion of drifts leads to the flow of carbon (C) into the inner divertor, as well as hydrogen. As a result, the density C in the cold region SOL of the inner divertor, elongated in the poloidal direction, increases.

As a rule, when describing the dependence on the H gas puff, either n_{esep} or the total amount of hydrogen in SOL, N_{tot}, is used as a parameter characterizing the discharge. We show that, from the point of view of assessing the influence of drifts, these quantities are not equivalent. If we consider the dependences of the main parameters characterizing the divertor, for example, the maximum heat load on the target, $q_{pk}(n_{esep})$, or the saturation current on the divertor plate, $I_{sat}(n_{esep})$, on n_{esep}, then these values, before the transition to detachment, practically do not change with the inclusion of drifts. At the same time, the same value of n_{esep} with and without drifts corresponds to two different values of N_{tot}. Therefore, in the sense of assessing the influence of drifts, for example, on q_{pk} or I_{sat}, N_{tot} is a more indicative value. On the other hand, this feature allows the use of drift-free calculations as a first approximation, if the corresponding parameters are taken as dependent on n_{esep}.

Also of interest is the observed effect of a more pronounced maximum on the $I_{sat}(n_{esep})$ dependence when drifts are included. We show that this is mainly due to the redistribution of emission from the carbon impurity. Without drifts, even after the transition to detachment, most of the sputtered carbon is retained in the cold region beyond the boundary of the ionization front; as a result, radiation losses actually reach saturation, and I_{sat} also saturates with them. With drifts, carbon retention in the divertor deteriorates; as a result, losses continue to increase, which is manifested in a stronger decline in $I_{sat}(n_{esep})$ after passing through the maximum.

*) abstracts of this report in Russian