THE INFLUENCE OF MASSIVE GAS injection ON THE THERMAL quench In the T-10 TOKAMAK

V.G. Kapralov, 1M.M. Dremin, V.E. Frolov, 1S.V. Krylov, 1A.S. Trubnikov, I.A. Sharov, V.V. Elagin, D.R. Totrov

SPbPU, Saint-Petersburg, RF, [kapralov@phtf.stu.neva.ru](mailto:kapralov@phtf.stu.neva.ru)  
1NRC «Kurchatov Institute», Moscow, RF, [Dremin\_MM@nrcki.ru](mailto:Dremin_MM@nrcki.ru)

The selection of an optimal scenario for controlled discharge mitigation and minimization of the probability of uncontrolled plasma disruption is an important task for large plasma machines, including the ITER tokamak reactor under construction [1]. Due to the fact that the physical processes at the boundary of the discharge and after thermal disruption have a relatively low values of the temperatures of various plasma components, it is possible to study them at small and medium tokamaks, with the subsequent extrapolation of the results to prepare experiments at large machines.

With the help of the active systems installed on the T-10 tokamak to influence the plasma discharge, it is possible to study scenarios of controlled plasma discharge quench, including various options of plasma disruption and suppression of runaway electron beams [2]. For such experiments, it is possible to use stationary and positioned pulse gas valves, injectors of impurity and hydrogen pellets, a chord pellet injection system, and an ECR plasma heating system. These active systems together with the main control system make it possible to vary the conditions for quenching of the plasma discharge within wide limits.

The use of a massive gas injection before plasma disruption leads to its initiation and allows one to study scenarios of optimal plasma quenching. The use of a massive gas injection after plasma disruption allows one to study the prevention of formation and suppression of runaway electron beams.

Simulation of disruption in the T-10 tokamak, including discharges using active systems to effect on plasma, was carried out using the ASTRA code [3]. In the first instance, the effect of active systems on thermal disruption was considered. Estimates are made of the possibilities of a complete thermal energy output due to repeated injections of a gas jet during thermal disruption, taking into account the geometry of the particle source location.

The authors thank the staff of the T-10 for the data and support.

Refrrences

1. Dremin M.M. et al., Problems of Atomic Science and Technology, Ser. Thermonuclear Fusion, 2012, issue 4, pp. 58.
2. Kapralov V.G. et al., Abstr. of XLII Int. Zvenigorod Conf. on PPCF, 2015, p. 123.
3. Kapralov V.G. et al., Abstr. of XLIV Int. Zvenigorod Conf. on PPCF, 2017, p. 112.