Modeling of plasma position and shape control during termination of T-15 discharges

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The aim of the work is to simulate the magnetic control of the plasma position and shape of the T-15 tokamak currently being modernized [1] at the current ramp down stage using the plasma-physical code DINA [2] and the developed regulators [3]. At the stage of the current ramp down, additional heating is turned off, the temperature and density of the plasma drop rapidly. This leads to abrupt changes in the values of β_p, l_i, q_{95} [4], which directly affects the stability of the plasma and the possibility of its stabilization by the magnetic control system. During the whole period of current ramp down, the plasma should be in a limited region on the diagram l_i - q_{95} [5] to avoid the development of instabilities and disruption, and maintain the divertor configuration to the minimum values of the plasma current. Several discharge termination scenarios that satisfy these criteria and take into account the actual characteristics of the poloidal magnetic field coil supplies are simulated in the work. The results of the simulation are used to determine the maximum achievable current ramp down rate in the T-15 tokamak.

References

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