MODELING OF PARTICLE TRANSFER, ENERGY TRANSFER, AND current rump-up IN THE iter TOKAMAK [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2022.49.1.172

2Khanaeva R.A., 1Khayrutdinov R.R.

1National Research Center "Kurchatov Institute", Moscow, Russian Federation,  
 [khayrutd@mail.ru](mailto:khayrutd@mail.ru)  
2Moscow Institute of Physics and Technology, Dolgoprudny, Russian Federation,  
 [hanaeva.ra@phystech.edu](mailto:hanaeva.ra@phystech.edu)

Plasma initiation stage is marked off from the rest of plasma scenarios in tokamaks. Several important events occur at this stage: transformation of an electron beam at the avalanche discharge stage into an ionized gas of chaotically moving particles at the Coulomb stage; phase transition “gas – plasma”; transformation of open magnetic surfaces into closed ones inside the plasma region starting from a certain plasma current. This separates the start-up plasma stage into a separate task [1]. Due to engineering limitations for the ITER tokamak, the requirements for the parameters of the initial stage of the discharge are especially strict, and some parameters of the problem are not quite definite. Simulation of transport processes at the initial stage of the discharge makes it possible to determine the conditions for the plasma initiation in the ITER tokamak. The feasibility of controlling physical processes in a tokamak plasma using feedback coupling is of considerable interest as well [2]. In this report, concentration, temperature, and current rump-up evolution is modeled on the basis of a system of 0D equations (with the inclusion of 2D effects) using feedback coupling. To simulate the start-up stage, the SCENPLINT code is used, which includes equations for the balance of energy and particles, equations for the evolution of the plasma current and the current of runaway electrons both for a purely ohmic start of the discharge and for ECRH-heated discharges.

References

1. V.A. Belyakov, K.M. Lobanov, L.P. Makarova, A.B. Mineev, V.V. Vasiliev, Plasma Initiation Stage Analysis with TRANSMAK code, Plasma Devices and Operations, 2003, v.11, no.3, p.193
2. V.E. Lukash, V.N. Dokuka, R.R. Khayrutdinov. DINA software-computing complex in the MATLAB system for solving problems of tokamak plasma control // VANT, ser. thermonuclear fusion, vol. 1, 2004, pp. 40-49

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/E/ru/II-Khanaeva.docx) [↑](#footnote-ref-1)