

## Software for Simulation of Fast Reactor Operation in a Closed Nuclear Fuel Cycle (SC RTM-2)

*Friday 22 April 2022 10:30 (2 hours)*

Fast reactor (FR) operation in closed nuclear fuel cycle (CNFC) is accompanied by the change in isotopic composition of a recycled fuel during a prolonged period of time (10-30 years). Series of similar calculations are required to determine optimal parameters of core charge and operational conditions during this transient phase of FR operation. To solve this problem, a RTM software complex has been developed. The software complex incorporates simulation of the reactor core and process stages of a fuel cycle. The RTM is intended for simulation of normal FR operating modes in the CNFC. Aside of simulation of the transient mode, the software complex is used to evaluate different scenarios of afterburning of long-lived actinides.

The software complex unites several computational modules: a code for neutron physical computation in diffusion approximation, a computational code for nuclear kinetics, and a code for simulation of process stages of a fuel cycle. The nuclear kinetics code allows one to calculate detailed isotopic composition of fission fragments in order to evaluate the activity and heat generation of spent nuclear fuel and radioactive waste. The process stage model is a balance model. The computational codes are united and controlled by a system shell. The system shell is a graphical interface designed to input initial data, and to view, compare and process the results of calculations. The system shell also includes a subsystem that checks the consistency of the initial data, and the scenarios and algorithms of solving benchmark problems.

The computational codes used in the RTM are not newly-developed products. However, integrating these codes into one software tool with a common system of initial data input and analysis of results makes it possible to obtain a new product for solving numerous problems of the same type. Such an integration of codes expands the capabilities of simulation of FR fuel cycles, reduces the scope of work required from a user to set the initial data, decreases the number of introduced errors, and enhances the efficiency of analysis of the obtained results.

### Country/Int. organization

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**Session Classification:** Poster Session

**Track Classification:** Track 6. Modelling, Simulations, and Digitilization