



Task for student research project or diploma thesis

Modelling of operational transients at the nuclear training and research reactor AKR-2 using the Monte Carlo code Serpent

The nuclear training and research reactor AKR-2 undergoes multiple transients during normal operation, planned experiments and educational demonstrations. These include but not limited to: reactor shutdown, reactor start-up, insertion and withdrawal of control rods and insertion and withdrawal of samples. As part of the NAUTILUS project, the modelling of these conditions is desired. One of the aims of the projects is to validate the Serpent model of the reactor and identify potential improvements to it.

From a research point of view, the utilization of the reactor as an educational platform restricts the time in which the reactor can be used for research purposes exclusively. However, during this research thesis, the student will be able to gather operational conditions such as power and temperature during educational activities and use them for a research purpose. These will be the conditions that the student will try to simulate and identify possible challenges and opportunities of the simulation of time dependent phenomena at the reactor.

For the abovementioned purposes, the following points are to be addressed:

- Study of literature on Monte Carlo methods for neutron transport.
- Familiarisation with the Monte Carlo neutron transport code Serpent.
- Compilation of operational and loading conditions of the reactor to be simulated.
- Investigation of the most adequate parameters for the time dependent simulations, for instance, number of particles, time binning, number of computer cores, etc.
- Comparison of simulations and operational data.
- Documentation of the results of the research project.

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<https://tu-dresden.de/ing/maschinenwesen/ifvu/wket/ausbildungskernreaktor-akr-2/profil>

<https://serpent.vtt.fi/>