



DOCTORAL RESEARCH TOPIC:

Safety assessment and investigation of the processes in the nuclear fusion facilities

RESEARCH FIELD:

Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

EU is implementing an ambitious research programme on nuclear fusion, which at first aims at starting up exploitation of research reactor ITER in 2025. According to roadmap developed by the European scientists and acknowledged by the European Commission the ITER will be followed by the fusion power plant DEMO. ITER aims at demonstration that from fusion it is technologically possible to retrieve more energy than is required to achieve fusion. DEMO aims at demonstration that fusion is feasible, i.e., it is not only technologically possible, but it is worth it in economic sense.

In development of such new technology as a fusion power plant there appears a number of different fundamental scientific and technological issues and challenges. At present there it is expected to develop a conceptual design of the DEMO power plant by 2027. To achieve this aim it is necessary to investigate and understand the physical, chemical and other processes that occur in the reactor in order to develop new and safe technologies.

The aim of this topic – investigate the physical, chemical and other processes that occur in the reactor in order to develop new and safe technologies for power generation. The main objectives of the topic: ITER and DEMO system analysis, 2) Deterministic safety analysis, and 3) probabilistic safety analysis.

To achieve the first objective the information about the DEMO power plant systems, their reliability and their interconnections will be collected to estimate the possible accident scenarios and suggest solutions to increase safety. To achieve the second objective the numerical models will be developed and simulations will be performed using the deterministic analysis methods for the selected accident scenarios. This analysis will be used to evaluate the safety of the planned technological solutions and suggest how they could be improved. To achieve the third objective the probabilistic methods will be used not only to evaluate the reliability of the systems and components but also to investigate the influence of the internal and external events on the safe operation of DEMO.

SCIENTIFIC SUPERVISOR:

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