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Overview of Experiments for Physics of Fast Reactors from the International Handbooks of Evaluated Criticality Safety Benchmark Experiments and Evaluated Reactor Physics Benchmark Experiments

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Specialists involved in the process of validation and verification of codes and cross sections for the physics of fast reactors traditionally used the benchmarks presented in the "Cross Section Evaluation Working Group Benchmark Specifications" BNL-19302 (ENDF-202) handbook first issued in 1974 and last updated in 1991. This handbook presents simplified homogeneous models of experiments with appropriate corrections of the experimental data. This approach was relevant to the codes and computational possibilities existed during the design of the first generations of fast reactors.

The Nuclear Energy Agency (NEA) of the Organisation for Economic Cooperation and Development (OECD) coordinates the activities of two international projects on the collection, evaluation and documentation of experimental data - the International Criticality Safety Benchmark Evaluation Project (ICSBEP) (since 1995) and the International Reactor Physics Experiment Evaluation Project (IRPhEP) (since 2003). The result of the activities of these projects are, every year updated, the International Handbooks of critical (ICSBEP Handbook) and reactor physics (IRPhEP Handbook) benchmark experiments. The handbooks present detailed models of experiments with minimal corrections and comprehensive evaluation of their uncertainties. Such models are of particular interest in terms of implementation of possibilities of the modern calculational codes and systems of automated prediction of the uncertainties of the design parameters and margins.

The Handbooks contain a large number of experiments which are suitable for the study of physics of fast reactors. Many of these experiments were performed at specialized critical facilities, such as BFS (Russia), ZPR and ZPPR (USA), ZEBRA (UK) or the experimental reactors - JOYO (Japan), FFTF (USA). Other experiments, such as compact metal assemblies, are also of interest in terms of the physics of fast reactors, were performed at the multipurpose critical facilities in Russia (VNIITF and VNIIEF) and the US (LANL, LLNL, and others.). Also worth mentioning is the critical experiments with fast reactor fuel rods in water, interesting in terms of verification of criticality safety during transportation and storage of fresh and spent fuel.

This report provides a detailed overview of the mentioned experiments, designates the areas of their applications and includes the results of calculations with modern cross sections in comparison with the evaluated benchmark data.

Country/Int. Organization

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