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Validation of ENDF/B-7.1 nuclear library on calculations of PIK-04 critical experiments

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The serial of critical experiments of circle geometry were performed in 70th of the last century at Petersburg Nuclear Physics Institute of the Russian Academy of Science [1,2]. The reactor PIK fuel elements of reduced length were used. Along these experiments the size of the inner water trap were varied. The geometry and the nuclear content of the fuel element were carefully measured.
The goal of this work is to validate using of the ENDF/B-7.1 nuclear data library on these experiments. At the moment the older library ENDF/B-6.0 is used for reactor PIK safety calculations. Unfortunately the bias in calculation using this two libraries of the reactor k_{eff} is significant. Especially it is concern the ^{235}U isotope. Doing the criticality calculation of these experiments can give us the possibility without additional complications of the whole reactor to validate the using of the new library.
The calculations were performed using MCNP and SCALE codes. The using of TSUNAMI module of the SCALE code make the opportunity to validate the PIK-04 critical experiments and made sensitivity calculations for the whole set of the nuclear reactions for all nuclei used in the experiment. With the help of the ICSBEP world base of criticality experiments we made trending analysis on different parameters. Also TSUFFER module gives us the idea of possible modification of nuclear data reaction libraries of elements used in the experiment.

1. I.A. Evdokimov, Yu.G. Kiselev, K.A. Konoplev, A.D. Kanonykhin et al. Critical masses of PIK-type fuel elements (Critical experiments on PIK-4 assembly). Preprint PNPI №2080 (1995)
2. M.S. Onegin, Yu.V. Petrov. ^{234}U and heterogeneous effects contributions to the reactivity of PIK-04 assemblies (Critical assemblies of PIK computations. Part I). Preprint PNPI №2169 (1997)

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