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Development of the NDA Technique for Verification of Critical Assembly with Partial Defect Test

At some locations, such as the critical facility Hyacinth [1] (JIPNR-Sosny, Belarus), the operator imposes some limitations on the availability of individual fuel cassettes for partial defect test verification. Due to the nuclear safety considerations the cassettes may not be extracted and the fissile material within the critical assembly shall be verified "as a whole".

To overcome the above challenge, new NDA method was developed in cooperation between the IAEA and JIPNR. The method is based on determination of the Reactivity Ratios (RR) at several sub-critical states and the comparison of the measured RR with the quantities, predicted by numerical model calculations for the declared configuration of the critical assembly. RR are inversely proportional to the ratios of net neutron count rates, measured during verification. The merit of the technique is its non-intrusiveness and a relative simplicity due to a weak dependence of the RR on the neutron detection efficiencies and the interrogation source term.

This paper describes the arrangements, equipment, data acquisition and analysis, as well as the results obtained with the method for the fast critical assembly at the Hyacinth facility. Validation of the method for the critical assembly in its thermal configuration is planned in 2018-2019.

Subject to successful demonstration of the method's conclusiveness and reliability, the IAEA will consider implementation of the technique at the critical assemblies and the research reactors in other Member States with safeguards agreement in force.

Which "Key Question" does your Abstract address?

TEC1.4

Which alternative "Key Question" does your Abstract address? (if any)

TEC1.1

Topics

TEC1

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