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Gamma Transport Calculations for Gamma Emission Tomography on Nuclear Fuel within the UGET Project

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The unattended gamma emission tomography (UGET) for spent nuclear fuel verification is an on-going project in the IAEA member states' support program. In line with the long term R&D plan of the IAEA Department of Safeguards, it is anticipated that this effort will help develop "more sensitive and less intrusive alternatives to existing NDA instruments to perform partial defect test on spent fuel assembly prior to transfer to difficult to access storage".

In the first phase of the project, gamma transport calculations and modelling of existing and proposed new designs of tomographic instruments is performed. In this paper, a set of Monte Carlo calculations regarding modelling of various tomographic devices are presented, including two existing tomographic instruments previously used for spent fuel measurements; one instrument based on scintillator detectors, developed by Uppsala University, and another based on CdTe detector arrays, developed by the JNT 1510 collaborative effort (Hungary, Finland). Detailed models of the tomographic instruments, including structural materials, and the measured fuel assemblies are used in the simulations. The calculated results are compared to the experimentally measured data to provide a benchmark for the simulation procedure.

The developed modelling capabilities are also used for evaluation of the partial-defect detection capabilities of the tomographic technique based on a proposed GET instrument design.

Country or International Organization

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