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Muon tomography for re-verification of spent fuel casks (the MUTOMCA project)

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The MUTOMCA (MUon TOMography for shielding CAsks) project investigates the suitability of muon tomography for the re-verification of spent fuel casks.
Spent fuel casks are stored, for decades, in dedicated locations and are under constant surveillance by the international agencies Euratom and IAEA through unattended monitoring equipment. In the hypothetical case that these instruments would temporarily fail, thus leading to a loss of Continuity of Knowledge (CoK), a re-verification of the spent fuel enclosed in self-shielding casks would be required.
The re-verification is particularly challenging for conventional non-destructive-assay (NDA) methods, since thick-walled spent fuel casks considerably attenuate the radiation emitted by the spent fuel. On the other hand, the inspectorates need a high degree of assurance on the amounts of nuclear material stored in those casks.
With the aim of proving the ability of muon tomography to detect a diversion of fuel assemblies in closed spent fuel casks, two muon detectors were designed, developed, constructed and commissioned. The detectors, which are based on drift tube technology, have been used, during the first months of 2023, in a field trial at a dry storage facility in Germany to examine a CASTOR®V/19 cask. Preliminary results will be presented along with the potentials and the drawbacks of the experimental apparatus.
The MUTOMCA research project was established by INFN Padova and Forschungszentrum Jülich GmbH (FZJ) in collaboration with BGZ Company for Interim Storage (BGZ Gesellschaft für Zwischenlagerung mbH) and the European Commission, Directorate-General for Energy.

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