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Neutron-Gamma Emission Tomography for radioactive waste characterization and nuclear security

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A project for non-destructive assay (NDA) of radioactive waste at the Studsvik nuclear decommissioning site is presented. The concept is based on a novel 3D radiation imaging modality for special nuclear materials (SNM) - neutron-gamma emission tomography (NGET) that was first demonstrated for nuclear security applications [1,2]. NGET has been recognized by the Royal Swedish Academy of Engineering Sciences (IVA) as one among the top 100 most important Swedish innovative research projects 2021 aiming at a sustainable preparedness for future societal crises [3].

More recently, the technique has been applied to localization and imaging of SNM inside shielded waste containers, adding to the array of existing techniques used for passive and active NDA in radioactive waste characterization. This project is aimed initially at the class of mixed, long-lived radioactive waste that is commonly called "legacy" or "historic waste" which has special safety, security and safeguards concerns due to its mixed composition, commonly poor documentation, and the frequent presence of SNM. However, a detection system featuring the NGET imaging modality might be applied to radioactive waste characterization in general, potentially including verification of spent nuclear fuel and other types of high-level waste suspected of containing SNM. The invention behind this novel radioactive waste characterization technique was recognized by awarded the Euratom Innovation Prize 2022 [4]. A major aim of this project is to enable a high degree of automation and high throughput capabilities. This would make it possible to quickly scan large radioactive waste inventories for the presence of special nuclear materials with minimal manual intervention.

References

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