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#6-102 Study of the industrial feasibility of Neutron Resonance Transmission Analysis (NRTA) for spent nuclear fuel reprocessing exploitation

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For nuclear fuel cycle reprocessing, accurate determination of the isotopic composition of nuclear materials, including Uranium, Plutonium, and minor actinides, is crucial for optimizing the spent fuel reprocessing process and ensuring nuclear safety. Current physico-chemical analysis methods face limitations concerning time-consumption, complex chemical operations, and/or lack of precise isotopic composition determination. Neutron Resonance Transmission Analysis (NRTA) is emerging as a promising novel solution, thanks to its isotopic specificity over a wide range of isotopes mentioned above. However, its use remains confined to research laboratories, due to the need for large-scale facilities to generate high neutron flux with good temporal resolution, such as the GELINA accelerator at JRC-Geel. Our work aims thus to assess the industrial feasibility of NRTA by developing a compact system optimized for industrial use, including a tabletop accelerator, a short flight path, and the ability to measure some realistic object used in La Hague facility.

In this work, we will present the objective of this research project with a description of the NRTA technique and its challenges for industrialization. We will present some results of Monte Carlo simulations and our quantification method developed to analyze the neutron resonance transmission through certain samples. Experimental validation of the simulations and data analysis methodology will also be discussed.

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