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First results of the measurement of the Ta(n,γ) cross-section at n_TOF, CERN

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Metallic alloys or metals with high melting points such as tantalum are being considered for the development of nuclear reactors for space. In recent critical experiments using highly enriched uranium or plutonium fuels, moderators and tantalum, large discrepancies have been found between the predicted and measured keff (i.e. needed critical masses). These observed discrepancies have been attributed to larger than reported uncertainties in the nuclear data of the materials involved, mainly tantalum, plutonium and graphite. The Ta(n,γ) cross section has also been reported as an important contributor to the uncertainty in the activation and heating of magnets used in large fusion reactors. The different measurements of the Ta neutron capture cross sections used in the evaluations are discrepant and affected by important experimental corrections like the self-shielding or angular correlations between γ-rays.
For these reasons, a new measurement of Ta(n,γ) cross section in the energy range from 0.1 eV to 500 keV has been performed at the n_TOF facility. The use of C6D6 detectors at different angles and samples of different thicknesses have allowed us to overcome the limitations of the previous measurements. This abstract presents the experiment conducted at n_TOF. It outlines the methodology employed for measurements and highlights the recent advancements in data analysis. In particular, the compatibility of the measurements made with different samples and different detectors will be presented as well as the preliminary comparison with the previous measurements and the most recent evaluations.

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