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The ^{239}Pu neutron capture and fission cross-section measurements at n_TOF, CERN

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The NEA/OECD included the cross-section of neutron capture and neutron-induced fission reactions for ^{239}Pu in its High Priority Request List, in response to the demands for more accurate and reliable nuclear data essential for the design and operation of nuclear technologies. Recent efforts have been concentrated on meeting these data needs by means of a new measurement utilizing ^{239}Pu samples in the n_TOF time-of-flight facility at CERN. This activity forms part of the scientific program approved by the European Commission H2020 Supplying Accurate Nuclear Data for energy and non-energy Applications (SANDA), and aims to improve the current knowledge and reduce existing uncertainties on the ^{239}Pu neutron capture and fission cross-sections, along with the α -ratio. Ten thin samples of 1 mg each were deposited within a novel ionization chamber, specifically designed for the challenging conditions of high counting rates coming from the α -decay of ^{239}Pu . This fission fragment detector was operated in combination with the n_TOF Total Absorption Calorimeter to highly suppress the γ -ray fission background in the measurement of the capture reaction cross-section, employing the so-called fission tagging technique. To extend the measurement of the capture cross-section, a thicker ^{239}Pu sample of 100 mg was also used. In addition to the cross-section data, the measurement will also provide valuable information on the distribution of the γ -rays cascades emitted in $^{239}\text{Pu}(n,\gamma)$ and $^{239}\text{Pu}(n,f)$ reactions, as experienced in previous experiments performed with the TAC. This contribution to the CNR*24 workshop will provide a description of the experimental activities of the ^{239}Pu measurement at n_TOF and will also show the latest updates on the data analysis, including preliminary results of the experimental reaction yields.

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