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Simultaneous measurement of the neutron-induced ^{233}U capture and fission cross sections

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^{233}U plays the essential role of the fissile nucleus in the Th-U fuel cycle, which has been proposed as a safer and cleaner alternative to the U-Pu fuel cycle. A particularity of ^{233}U is its small neutron capture cross-section which is about one order of magnitude lower than the fission cross-section on average. Therefore, the accuracy in the measurement of the ^{233}U capture cross-section essentially relies on efficient capture-fission discrimination thus a combined setup of fission and γ -detectors is needed. A new measurement campaign of the ^{233}U capture cross-section and alpha ratio has been proposed at the CERN n_TOF facility using the facility's Total Absorption Calorimeter (TAC) coupled with a compact fission detector. For this measurement, a novel cylindrical multi ionization cell chamber was developed in order to provide a compact solution for 14 active targets. Due to the high specific activity of ^{233}U fast timing properties are required and achieved with the use of customized electronics and the very fast ionizing gas CF_4 . The measurement was recently successfully performed and is expected to provide the neutron-induced capture and fission cross sections for this important isotope, as well as very valuable information on the distribution of energies and multiplicities of the prompt γ -rays emitted after capture and fission reactions. The experimental setup, the n_TOF facility as well as preliminary results will be presented and discussed.

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