Properties of proton-induced fission processes on actinide nuclei at energies between 20 and 80 MeV

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Considerable effort has been devoted over the last decades to feasibility studies of accelerator driven systems (ADS) for transmutation of long-lived radioactive wastes. These new technologies require a more extensive and reliable database of nuclear fission properties. High-energy neutron- and proton-induced fission data are needed for ADS applications. On the theoretical front, fission data are also required for a better understanding of the nuclear processes involved and for the improvement of theoretical models and evaluation codes.

In this report, we present the results of measurements of proton-induced fission on ^{232}Th, ^{238}U, ^{237}Np, ^{239}Pu, ^{241}Am nuclei at proton energies of 26.5 and 62.9 MeV that were performed at the Louvain-la-Neuve cyclotron facility CYCLONE. Neutrons were detected with the neutron multi-detector DEMON. Mass and energy distributions of fission fragments, neutron multiplicities and fission total cross sections were determined. The relative contributions of the processes involved were reproduced with moving multi-source fits and were also compared with state-of-the-art nuclear reaction models. The code used for this purpose, TALYS, takes into account evaporation and pre-equilibrium emission as well as fission.

The experimental set-up, data analysis, and comparison of the experimental results with the theoretical predictions will be discussed at length.