Photonuclear Data Evaluations of Actinides

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Abstract

There is a renewed interest in photonuclear reactions for various applications such as radioactive ion beam and neutron production, waste transmutation or detection of nuclear materials. However, contrary to the neutron induced reactions, evaluated nuclear data files for photons contain little information, especially for incident energies above 20 MeV.

In addition to the above applications, from a physics point of view, gamma induced reactions allow to study nuclear reaction mechanisms, e.g. fission through the different observables as cross sections, fission yields, prompt or delayed neutron multiplicities as well as their energy spectrum. Moreover, the use of photons makes possible the study of formation and decay of compound nucleus hardly available with a direct neutron probe (e.g. ^{238}U). Finally, the consistent modeling of both neutron *and photon* induced reactions better constrains nuclear models and improves the reliability of the overall nuclear data modeling.

This contribution will give an overview of our on-going activities on photonuclear data evaluation of thorium and uranium isotopes using nuclear reaction codes (GNASH, TALYS, ABLA). Starting from available measurements we will show the ability (and the limits) of nuclear reaction models to reproduce in a consistent way experimental observables (cross sections, fission yields, neutron multiplicities, energy spectrum, etc.). Recent measurements of delayed neutron yields also performed by our group will complement this evaluation effort and the outcome will be proposed for insertion into the Joint Evaluated Fission and Fusion (JEFF) library to answer application needs up to 150 MeV.