Prompt Fission Neutron Spectra of ^{233}U(*n,F*)

V.M. Maslov

Slobodskoy proezd 4, 220025 Minsk, Byelorussia
e-mail: mvm2386@yandex.ru

Prompt fission neutron spectra (PFNS) are produced for incident neutron energies from thermal up to 20 MeV. Simultaneous analysis of measured and calculated data for ^{235}U(*n,F*), ^{239}Pu(*n,F*) [1] and ^{233}U(*n,F*) maintains stronger justification for the predicted PFNS of ^{233}U(*n,F*). For the latter the reliable measured PFNS data are available at E_n~ E_{th} only. Pre-fission neutron spectra influence the partitioning of fission energy between excitation energy and total kinetic energy of fission fragments. For the reactions ^{233}U(*n,F*) and ^{235}U(*n,F*) shape of prompt fission neutron spectra (PFNS) strongly depends on the fissility of composite and residual nuclides (Fig.1). The correlation of these peculiarities with emissive fission contributions (*n,xnf*) to the observed fission cross section and competition of the reactions (*n,nγ*) and $(n,xn)^{1,..x}$ is established. Exclusive neutron spectra $(n,xnf)^{1,..x}$ are consistent with fission cross sections of ^{235}U(*n,F*), ^{234}U(*n,F*), ^{233}U(*n,F*) and ^{232}U(*n,F*) reactions, as well as neutron emissive spectra of ^{235}U(*n,xn*) at ~14 MeV. Initial model parameters for ^{233}U(*n,F*) PFNS are fixed by description of PFNS of ^{233}U(n_{th},*F*). We predict the ^{233}U$(n,xnf)^{1,..x}$ exclusive pre-fission neutron spectra, exclusive neutron spectra of ^{233}U$(n,xn)^{1,..x}$ reactions, total kinetic energy TKE of fission fragments and products, partials of average prompt fission neutron number and observed PFNS of ^{233}U(*n,F*). PFNS of ^{233}U(*n,F*) are harder than those of ^{235}U(*n,F*) PFNS, but softer than those of ^{239}Pu(*n,F*). Difference of average energies of PFNS <E> of ^{233}U(*n,F*) and ^{235}U(*n,F*) amounts to 1~3 %. At incident energies higher than (*n,2nf*) reaction threshold the observed PFNS may seem similar, though the partial contributions of ^{233}U(*n,xnf*) and ^{235}U(*n,xnf*) to the observed PFNS are quite different.

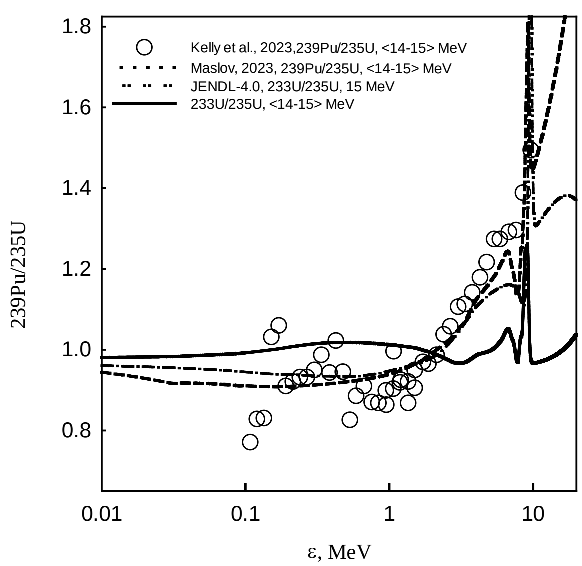

Fig.1. ^{235}U(*n,F*), ^{233}U(*n,F*), ^{239}Pu(*n,F*) PFNS ratios.

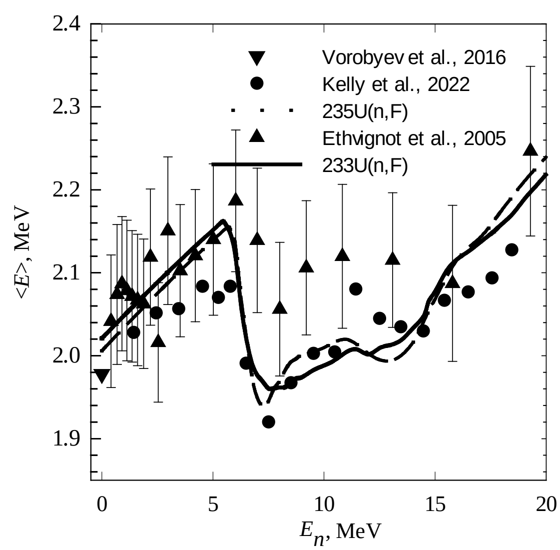

Fig.2. ^{235}U(*n,F*) and ^{233}U(*n,F*) <E> of PFNS.

1. V.M. Maslov, Physics of Atomic Nuclei, 2023, vol.86, No. 5, pp. 627–629.