ANISOTROPY IN PRE-FISSION NEUTRON SPECTRA OF ^{235}U(n,*f*)

V.M. Maslov

Slobodskoy proezd 4, 220025 Minsk, Byelorussia

Angular anisotropy of secondary neutrons was evidenced in neutron emission spectra (NES) [1], and prompt fission neutron spectra (PFNS) [2]. In case of NES that is due to pre-equilibrium/semi-direct mechanism of emission of first neutron in $(n,nX)^1$ reaction, while in case of PFNS by exclusive spectra of pre-fission neutrons of $(n,xnf)^1$ [3]. In ^{239}Pu$(n,xnf)^{1,..x}$ and ^{235}U$(n,xnf)^{1,..x}$ reactions observed PFNS demonstrate differing response to the emission of first pre-fission neutron in forward and backward semi-spheres. Mean energies of $(n,nf)^1$ neutrons depends on its angle of emission θ with respect to the incident beam. The average prompt fission neutron number, fission cross section, TKE depend on θ as well. Exclusive spectra of $(n,xnf)^{1,..x}$ neutrons at θ~90^o are consistent with ^{235}U(n,f)(^{235}U(n,xn)) and ^{239}Pu(n,f)(^{239}Pu(n,xn)) observed cross sections and neutron emission data at E_n~0.01–20 MeV.

The correlations of the angular anisotropy of PFNS with the relative contribution of the (n,nf) fission chance to the observed fission cross section and angular anisotropy of neutron emission spectra are revealed. The exclusive spectra of $(n,xnf)^{1,..x}$ and $(n,n\gamma)$ and $(n,xn)^{1,..x}$ reactions are calculated alongside with (n,f) and (n,xn) cross sections within Hauser-Feshbach formalism, the angular anisotropy of $(n,nX)^1$ neutrons being included (Fig. 1). The ratios of mean PFNS energies $\langle E \rangle$ for forward and backward emission of ^{235}U(n,xnf) pre-fission neutrons (Fig. 2) are consistent with measured data [2].

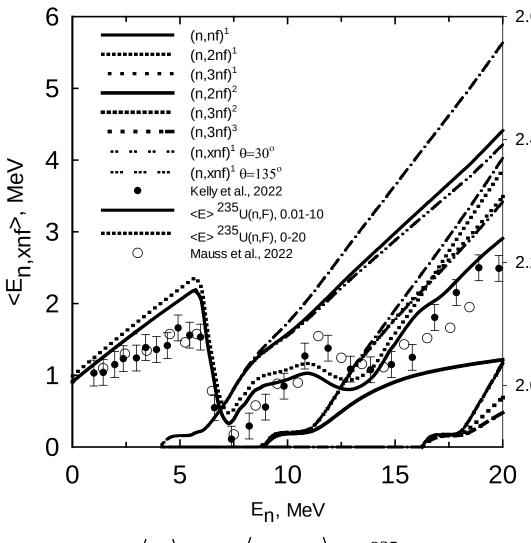

Fig. 1 $\langle E \rangle$ and $\langle E_{n,xnf} \rangle$ of ^{235}U(n,*f*) .

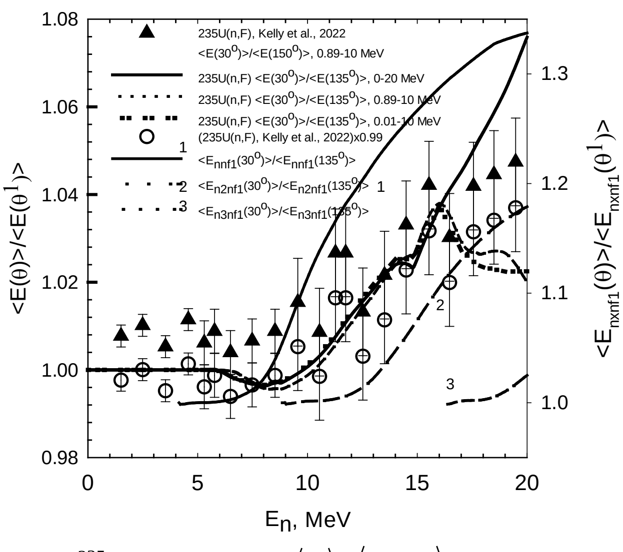

Fig.2 ^{235}U(n,*f*) ratios of $\langle E \rangle, \langle E_{n,xnf} \rangle$ at 30^o/135^o.

1. Kammerdiener J.L., UCRL-51232, 1972.
2. Kelly K. J., Gomez J.A., Devlin M. et al, Phys. Rev. C **105**, 044615 (2022).
3. Maslov V.M., LXXII International Conference “ NUCLEUS-2022, Fundamental problems and applications”, Moscow, July, 11—16, 2022, Book of Abstracts, p.168, https://events.sinp.msu.ru /event/ 8/attachments/181/875 nucleus-2022-book-of-abstracts-www.pdf.
4. Mauss B., Taieb J., Laurent B. et al., https://oecd-nea.org/dbdata/nds_jefdoc/jefdoc-2200.pdf, Nuclear Data Week, November, 2022, JEFDOC-2200.