Prompt fission neutron spectra and TKE of ^{235}U(n, F) and ^{239}Pu(n, F)

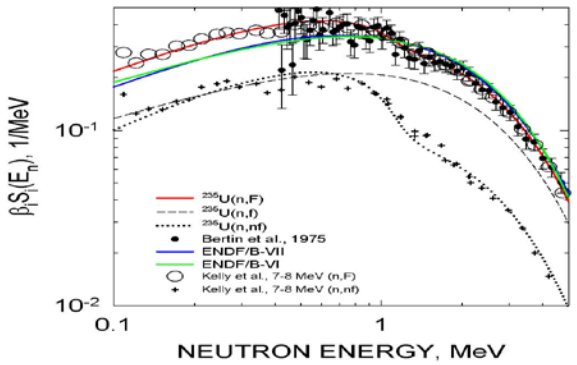
V.M. Maslov

Joint Institute for Nuclear and Energy Research, 220109, Minsk-Sosny, Belarus

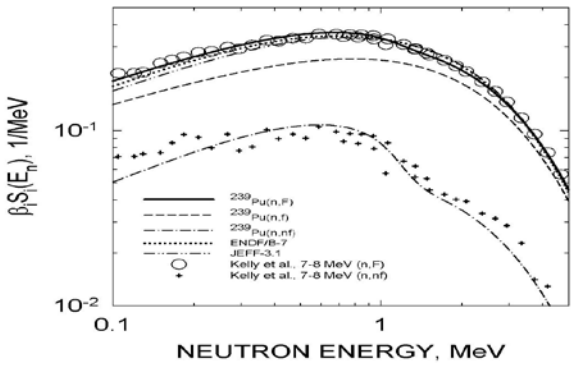
Matrices of prompt fission neutrons spectra of ^{235}U(n,F) and ^{239}Pu(n,F), describing based on /1-5/ all measured data shapes, TKE, average number of prompt fission neutrons and (n,F) and (n,xn) reaction cross sections up to 20 MeV are provided. PFNS of ^{235}U(n,F) and ^{239}Pu(n,F) in the newest data libraries ENDF/B-VIII, JEFF-3.3 and JENDL-4.0 are roughly discrepant as regards the PFNS shapes and average energies. In a number of cases they are discrepant with the newest differential measured data /6-10/.

The correlation of the PFNS shape at $E_n = 10^{-5}$~20 MeV with the target nuclide fissility and excitation energy is investigated. The calculated shapes are consistent with the measured PFNS of 235U(n,F) and 239Pu(n,F) and their ratios in the domain of first chance and emissive fission. That comprises the basis for the (n,xnf) neutrons contribution to the observed PFNS (see /2-5/). Local maxima in observed TKE are correlated with (n,nf) and (n,2nf) thresholds of 235U(n, F) and 239Pu(n, F) /11,12/ reactions. The contribution of the (n,xnf) pre-fission neutrons to the observed PFNS diminishes drastically with the increase of the fissility of the compound nuclide. The contribution of the (n,2nf) reaction neutrons, strong in case of 235U(n,F), influences only slightly on the observed PFNS of 239Pu(n,F) at E>14 MeV /4/. TKE E_f^{post} of fission products are $E_f^{post} \approx E_f^{pre}\left(1-\nu_{post}/\left(A-\nu_{pre}\right)\right), \nu_p = \nu_{post} + \nu_{pre}$.

^{235}U(n,F) PFNS 7 MeV



^{239}Pu(n,F) PFNS 7 MeV



TKE E_f^{post} of fission products are $E_f^{post} \approx E_f^{pre}\left(1-\nu_{post}/\left(A-\nu_{pre}\right)\right), \nu_p = \nu_{post} + \nu_{pre}$. Variation of TKE of fission fragments E_f^{pre} /11,12/, before neutron emission fission fragments are defined as $E_f^{pre}(E_n) = \sum_{x=0}^{X} E_{fx}^{pre}(E_{nx}) \cdot \sigma_{n,xnf} / \sigma_{n,F}$, $E_{nx} = E_n + B_n - \sum_{x=0,1\le j\le x}^{X}\left(\left\langle E_{n,xnf}^{j}\right\rangle + B_x\right)$.

1. N.V. Kornilov et al., Phys. At. Nucl., **62**, 173 (1999).
2. V.M. Maslov et al., Nucl. Phys. A **760**, 274 (2005).
3. V.M. Maslov et al., Journal of Korean Phys. Soc., **59**, 2, 1337 (2011).
4. V.M. Maslov, Atomic Energy, **103**, No. 2, 633 (2007)
5. V.M. Maslov et al., Atomic Energy, Vol. **108**, 432 (2010).
6. A. Bertin, R. Bois, J. Frehaut CEA-R-4913, CEA, 1978
7. M. Devlin e. a. Eur. Phys. Journ. Web of Conferences, 2020, v. **239**, 01003.
8. K. J., Kelly, J. A.Gomez e. a. Eur. Phys. Journ. Web of Conferences, 2020, v. **239**, 05010.
9. K. J. Kelly, M. Devlin, e. a. Phys. Rev., 2020, v. C **102**, p. 034615(1) – 0344615(26).
10. A. Chatillon et al., Phys. Rev. C**89**, 014611 (2014).
11. D.L. Duke et al., Nucl. Phys. A **970**, 65 (2018).
12. K.Meierbachtol et al., Phys. Rev. C, **94**, 034611 (2016).