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^{236s}Np isomer yields in ^{237}Np(n,2n) and ^{238}U(p,3n) reactions

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Modeling $r(E_n)$, ratio of the yields of short-lived (1^-) and long-lived (6^-) of ^{237}Np(*n*,2*n*) reaction from threshold energy up to 20 MeV allowed to infer also the yield of the short-lived state ^{236s}Np in ^{238}U(*p*,3*n*) reaction (Fig. 1). The different initial spin populations is probed in (*p*,3*n*) and (*n*,2*n*) reactions. The consistent description of the data base on cross sections of fission ^{237}Np(*n,F*) , ^{237}Np(*n*,2*n*)^{236s}Np (Fig. 2) and ^{238}U(*p,F*), ^{238}U(*p,n*) and ^{238}U(*p*,3*n*)^{236s}Np is achieved. The branching ratio $r(E_n)$ obtained by modeling the residual nuclide ^{236}Np levels. Excited levels of ^{236}Np are modeled using predicted Gallher-Moshkowski doublets. The branching ratio $r(E_n)$ is defined by the ratio of the populations of the two lowest states, isomer ^{236s}Np, with spin *J*=1 and ground state ^{236l}Np with spin *J*=6. The $r(E_n)$ and $r(E_p)$ have similar shapes in case of (*n*,2*n*) and (*p*,3*n*) reactions, which is due to compensation of differing angular momentum and excitation energy distributions of ^{236}Np yields. The populations of ^{236s}Np and ^{236l}Np states defined by the γ-decay of the excited states of ^{236}Np in the continuum. The exclusive spectra of (*n,xnf*) and $(n,2n)^{1,2}$ and (*p,xnf*) and $(p,3n)^{1,2,3}$ influence $r(E_n)$ at higher energies and prompt fission neutron spectra.

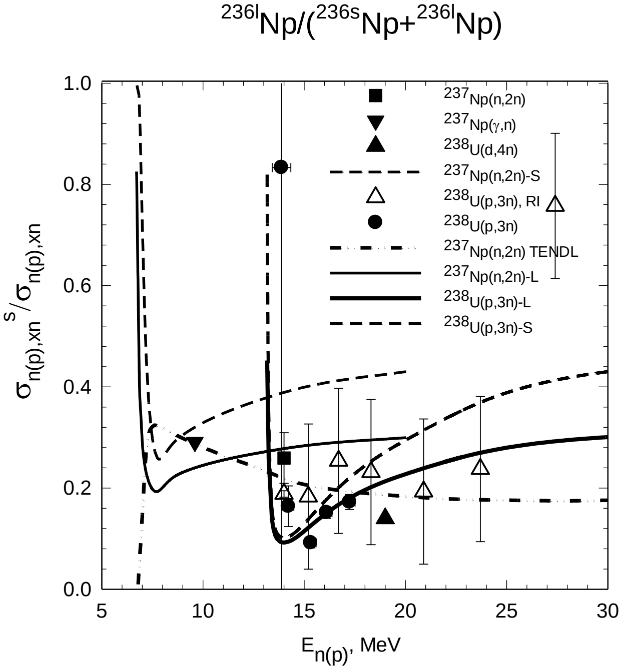

Fig. 1 Relative yield of long-lived (6^-) ^{236l}Np state in ^{237}Np(*n*,2*n*)^{236l}Np reaction.

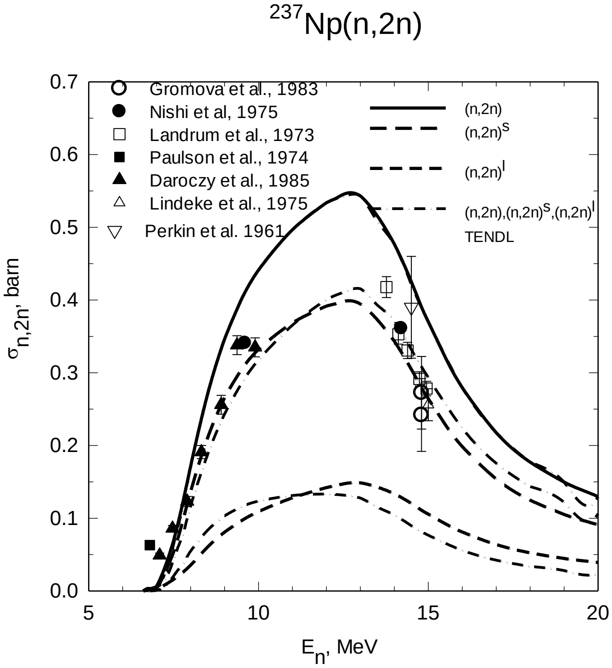

Fig.2 Cross sections of ^{237}Np(*n*,2*n*), ^{237}Np(*n*,2*n*)^{236s}Np and ^{237}Np(*n*,2*n*) and ^{238}U(*p*,3*n*) reactions.