

Nuclear Data Measurements in Russia

B.I.Fursov, A.V.Ignatyuk

Institute of Physics and Power Engineering, Obninsk, Russia

Main results of nuclear data measurements in Russia during the last years were presented a quite completely in contributions to the Nuclear Data Meeting at Santa Fe (September, 2005). on a revision of most important neutron data for advanced nuclear reactors and a formation of the new version of the BROND-3 library. A large attention was also spent to accumulation of data required for a nuclear waste transmutation of the basis of accelerator driven systems. The following results should be mentioned:

Measurements at IPPE (Obninsk)

i) In addition to the previous results for ^{233}U , ^{235}U , ^{238}U , ^{237}Np , and ^{239}Pu the total and relative group yields of delayed neutrons, as well as the corresponding group half-life times, were measured in the last year for ^{232}Th in the incident-neutron energies between 3.5 and 5 MeV and for ^{241}Am in the energy range from 0.75 to 5 MeV. The average half-lives obtained from the measured decay curves are compared with previous experimental data in Fig. 1. The measurements were supported by the ISTC Project-2253. Energy dependences of the delayed fission-neutron parameters were re-evaluated for plutonium and americium isotopes on the basis of the obtained experimental data. The eight-group representation was used instead the previous six-group one. These evaluations should be included in the corresponding BROND-3 files.

ii) Works were continued on preparations to measurements of the fission cross sections at the region of unresolved resonances for strongly radioactive americium and curium isotopes with the new lead-slowing-down spectrometer at the Institute of Nuclear Research RAN (Troitsk). Some preliminary measurements were performed for ^{235}U , ^{237}Np , and ^{239}Pu to test intensities of the neutron flux inside the spectrometer. High price of target preparation for curium isotopes limits possible measurements rather strongly and an international support of this activity is very desirable. Such measurements should essentially reduce uncertainties of experimental data on the fission cross sections of minor actinides, transmutation of which relates nowadays to one of the most topical task.

iii) IPPE specialists taken active part at the n_TOF measurements of the fission cross sections for uranium and americium isotopes. Preliminary results of the measurements were presented at some international meetings, but main part of data obtained are still under processing

Measurements at the Radium Institute (St.Petersburg):

The processing of data on the high-energy neutron-induced fission cross-sections of actinides measured before with the GNEIS facility (PINP, Gatchina) is still continued. A more careful analysis of the original data allowed to reduce essentially contradictions between the new data and the available data at the energies below 20 MeV. The re-analyzed data for ^{243}Am energies are shown in Fig. 2. Uncertainties of new data are about 5% for all energies above 1 MeV. The work is performed in the frame of the Project ISTC-1971.

Measurements at the ITEP (Moscow)

Large amount of data on the cumulative yields of spallation and fission products was obtained during the last year for the targets of ^{206}Pb , ^{207}Pb , ^{208}Pb and ^{209}Bi irradiated by protons with energies from 40 MeV to 2.6 GeV. The corresponding data for ^{208}Pb at energies 2.6 GeV, 750, 250, and 70 MeV are compared in Fig. 3 with the intranuclear cascade model (INCM) calculations. Similar experimental data were obtained also for the energies 1.6 and 1.2 GeV, and 900, 600, 150, 100, and 40 MeV for all

targets. The adjustment of model parameters, performed for some widely used codes, improves essentially the predictive accuracy of INCM calculations. The corresponding experimental data together with their theoretical analysis are included in the final report of the Project ISTC-2002 that is under a distribution now to the Project collaborators.

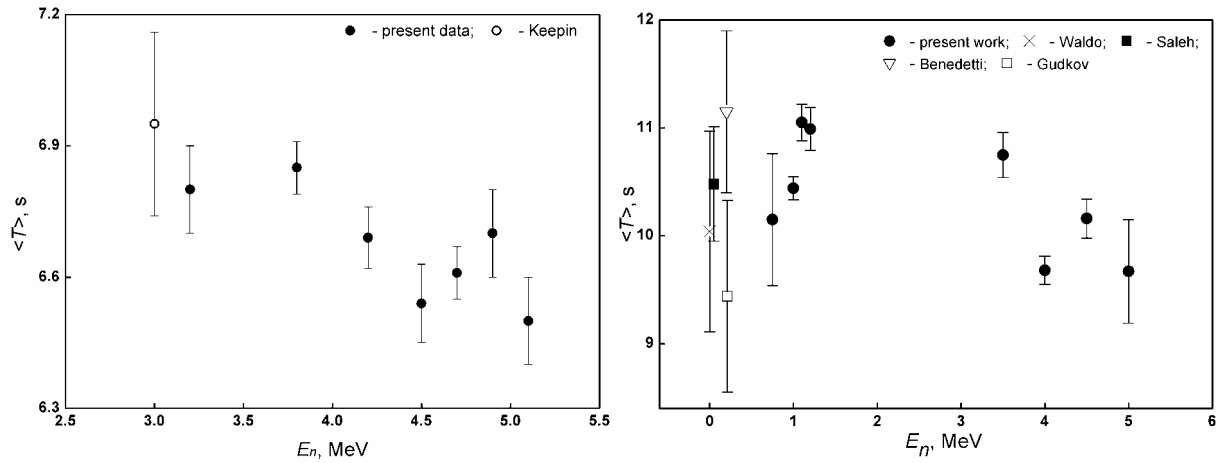


Fig.1. Energy dependence of the average half-life of delayed neutrons for ^{232}Th (left) and ^{241}Am (right).

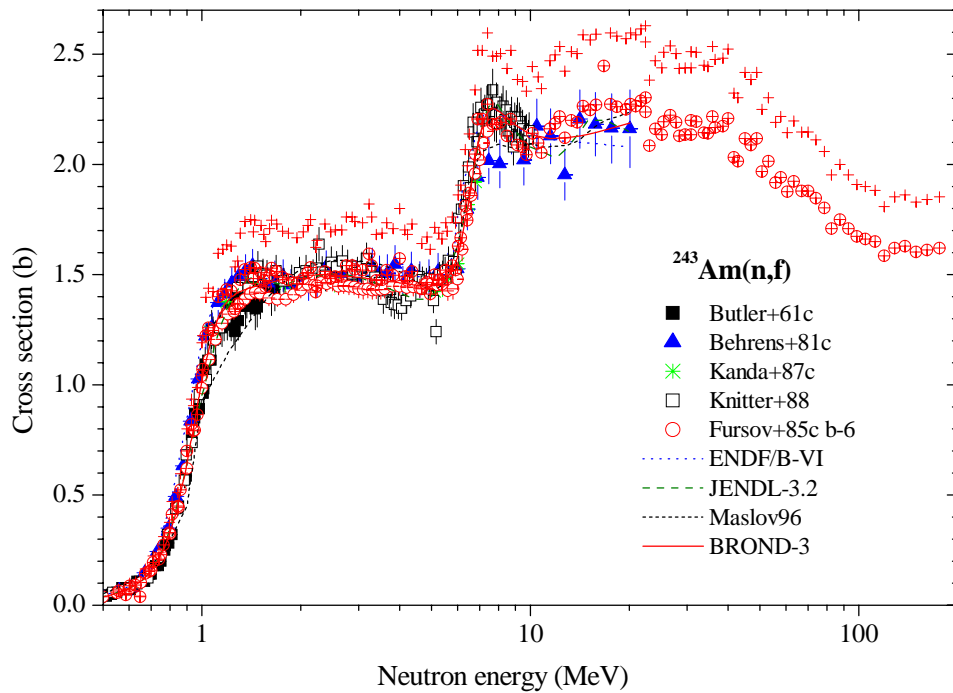


Fig. 2. Preliminary (+) and final (\oplus) data on the fission cross sections for ^{243}Am in comparison with other experimental data and the available evaluations

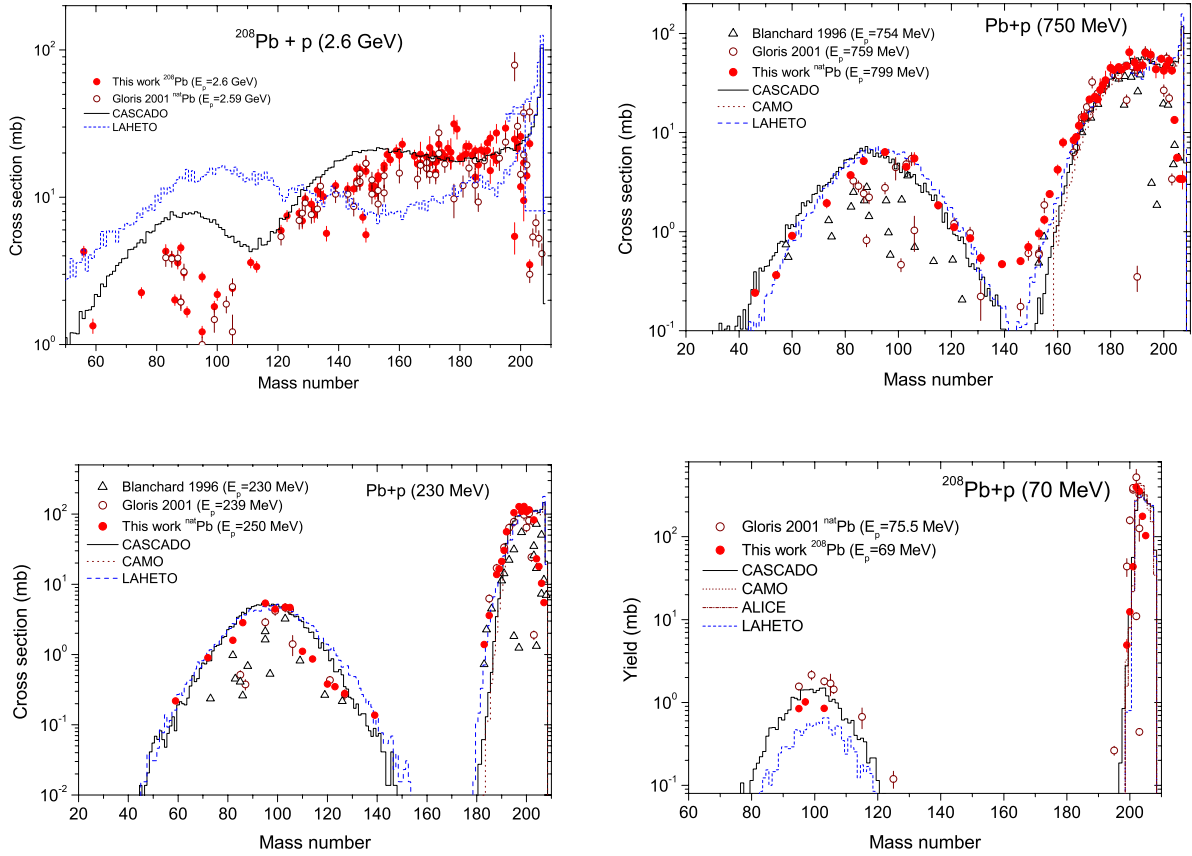


Fig. 3. Experimental data on the and residual cumulative yields (solid and open circles) for the $^{208}\text{Pb} + p$ reaction at various energies in comparison with cascade-model calculations