

Fission Cross Section Measurements up to 200 MeV

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The activity in intermediate energy particle induced fission cross-section measurements of Pu and U isotopes, minor actinides and sub-actinides in PNPI of Russia is reviewed. Experiments performed at the GNEIS facility [1] is described in some detail. The neutron-induced fission cross-section measurements at the GNEIS facility are under way in the wide energy range of incident neutrons from 0.5 MeV to 200 MeV in frame of long-term investigation program. During the first stage of this research program the measurements of fission cross-sections of ^{233}U , ^{238}U , ^{232}Th , ^{237}Np , ^{239}Pu , $^{\text{nat}}\text{Pb}$ and ^{209}Bi have been performed under support of the ISTC grant # 609-97 [2]. Not long ago the new measurements of neutron-induced fission cross-section of ^{240}Pu , ^{243}Am and $^{\text{nat}}\text{W}$ have been completed at the GNEIS facility in frame of the ISTC Project # 1971 [3]. The measurements were performed simultaneously for each investigated isotopic targets using two multiplate ionization chambers and time-of-flight technique on a 48-m flight path. The 1-GeV proton synchrocyclotron of PNPI was used as a “white spectrum” neutron source with average intensity $3 \cdot 10^{14}$ n/s, burst duration 10 ns and repetition rate up to 50 Hz. TOF and pulse-height spectra were measured and accumulated for each target using the data acquisition system based on a 100-MHz Flash-ADC. Statistical accuracy of measured cross section of actinide nuclei is about 1-2 % at neutron energies above 1 MeV and that of sub-actinide nuclei $^{\text{nat}}\text{Pb}$ and ^{209}Bi varies from 3 % at 100 MeV to 1.6 % at 200 MeV but in case of $^{\text{nat}}\text{W}$ it varies from 19 % at 100 MeV to 7 % at 200 MeV. The experimental data obtained are presented in comparison with the data of other authors and libraries’ evaluations, theoretical calculations and systematics.

In another group of experiments the proton-induced fission cross section measurements of the same isotopes have been taken at the proton beam of PNPI synchrocyclotron energies ranging from 200 to 1000 MeV at 100 MeV intervals in frame of the ISTC Project # 1405 [4]. The measurement method is based on the registration in coincidence of both fission fragments by two parallel plate avalanche counters located at very close distance from target. The results on energy dependence of total fission cross sections of ^{233}U , ^{235}U and ^{238}U targets are presented.

References

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