High resolution cross section measurements on ^{206}Pb and the impact on the status of the cross section data for Pb-Bi target, coolant and moderator systems

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The most promising Accelerator Driven System (ADS) will be based on the use of Lead-Bismuth eutectic as spallation target, coolant and moderator. Therefore, for the design, optimisation and safety assessment of such systems, the nuclear data for neutron induced reactions in ^{204,206,207,208}Pb and ^{209}Bi play an important role. For high energies, above the resonance region, A.J. Koning and collaborators produced a revised evaluated data file for Pb and Bi isotopes. Their evaluation, using the TALYS code, includes the recent cross measurements of the HINDAS project. In the resolved resonance region, the available experimental data for Pb-isotopes and ^{209}Bi result from measurements primarily focused on fundamental physics research, such as doorway states in closed shell regions, and to astrophysics applications. The total and partial cross section measurements were not performed in support to a specific programme related to the nuclear fuel cycle. These considerations express the need for improved nuclear data for ADS and fast reactor technologies in the resonance region for Pb isotopes and of ^{209}Bi. At GELINA we started ^{206}Pb transmission and capture cross section measurements in an energy range from the eV region up to 500 keV, with a time resolution (1 ns) that was not reached before. The capture measurements together with a resonance shape analysis are finalised. A comparison of our resonance data for ^{206}Pb with the data used for the present evaluations reveals discrepancies up $20 - 30\%$. These discrepancies result from systematic uncertainties due to angular correlation effects, the neutron sensitivity of the detectors and the use of weighting function not accounting for the gamma transport in the sample. Since the evaluated data for ^{204,207,208}Pb and ^{209}Bi are based on similar experiments, these data will suffer from similar systematic uncertainties.

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