New measurement of the capture cross section of bismuth and lead isotopes

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Lead and bismuth capture data are important in the field of energy production and nuclear waste transmutation, in order to evaluate the neutron balance in the core of an Accelerator Driven System (ADS) with Pb-Bi spallation target and also to account for the synthesis of ^{210m}Bi through capture reactions, which determines the long term radiactivity of the spallation source.

In astrophysics, ^{208}Pb and ^{209}Bi represent the end point of the s-process, which by means of (n,γ) reactions builds around half of the isotopic abundances in the mass region A $\geq$ 56. Accurate capture data on these end point isotopes are required to further develop nucleosynthesis stellar modells and obtain heavy elements abundance predictions compatible with observations.

Capture in these isotopes is difficult to measure not only due to their small cross section but also due to the relatively high rate of scattered neutrons which can interact in the detector and surrounding material and mimic a capture signal. This has been a source of systematic uncertainty in previous experiments.

All the stable lead isotopes and ^{209}Bi have been recently measured at n_TOF (CERN) in the range from 1 eV up to 1 MeV, using an optimized experimental setup. A set of two homemade C_6D_6 detectors with carbon fiber canning was designed to greatly reduce the scattered neutron sensitivity. Surrounding elements like the sample holder and the sample exchanger have been made also of carbon fiber.

The pulse height weighting technique, has been used in order to determine the (n,γ) cross sections. Concerning this technique, special care has been taken in the treatment of several sources of error leading to a total systematic uncertainty of less than 3%.

Results on the analysed ^{207}Pb, ^{208}Pb and ^{209}Bi capture data and a comparison with previous experiments and data bases will be presented.

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