Measurement of the resonance capture cross section of ^{204,206}Pb and termination of the s-process*

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The neutron capture cross sections of ^{204,206}Pb have been measured with high resolution at the n_TOF facility of CERN (Geneva).

The neutron capture cross section of ^{204}Pb is of particular relevance in astrophysics, since this s-only isotope constrains the branching of the reaction path at $A = 204$. The predicted abundance of this isotope is very sensitive to the details of the stellar model. Therefore, an accurate value of its capture cross section provides an important test and constraint for astrophysical models.

^{206}Pb is representative of the entire reaction flow, thus its abundance scales with the inverse of the cross section, becoming practically independent of the specific stellar model employed. Consequently, its r-process abundance is well determined as the substraction of the s-abundance from the total observed abundance. The r-process abundance is important as a constraint for the U/Th-cosmochronometer.

Because of the occurence (26%) of ^{206}Pb in natural lead, its capture cross section is also important for the design of hybrid reactors based on Pb/Bi eutectic spallation sources.

The major motivation of the present measurements was to overcome the main experimental difficulty, which arises from the dominant scattering channel of most of the measured resonances. For this purpose, a set of two optimized C_6D_6 detectors have been employed at n_TOF. Additional improvements with respect to previous experiments include improved weighting functions in the data reduction process and also a thorough treatment of the different sources of experimental error by means of detailed Monte Carlo calculations.

The results obtained at n_TOF are compared with previous existing measurements and implications in the field of the stellar nucleosynthesis are discussed.

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