

Stable beam experiments in wide energy ranges serving low energy nuclear astrophysics

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(Dated: June 7, 2019)

It is common knowledge in nuclear astrophysics that reaction cross section measurements need to be carried out at energies as low as possible, ideally reaching the astrophysically relevant energies. This latter requirement is unfortunately fulfilled only very rarely, therefore the rates of reactions are obtained from extrapolated or calculated cross sections. The extrapolation definitely needs higher energy cross sections but the validity of calculations should also be supported by experimental data at higher energies where the measurements are possible. This is especially true in the present era of high precision astrophysics when the reaction rate uncertainties often represent the most important uncertainty in stellar models.

In this talk I will use several examples for demonstrating the usefulness of cross section measurements of alpha- and proton-induced reactions in wide energy ranges above the astrophysically relevant ones. The examples will include reactions of hydrogen burning as well as of heavy element nucleosynthesis in the p-process studied recently in Atomki. The benefits of the activation method [1], a powerful technique for cross section measurements, will also be highlighted.

[1] Gy. Gyürky et al., *Eur. Phys. J. A* **55**, 41 (2019).