

The astrophysical proton-capture campaign at the GSI storage rings: Status and outlook

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The experimental astrophysics program at the ESR aims at measuring nuclear capture reactions at low energies. The motivation for such measurements arises from models of nuclear reaction networks in explosive nucleosynthesis scenarios [1,2] such as X-ray bursts or supernovae. Under such hot and dense conditions the majority of nuclear reactions involves radioactive nuclei for which the reaction rates are experimentally unknown and introduce large uncertainties to the final production yields [3]. Diminishing these nuclear uncertainties would generate strong constraints for stellar models and will eventually lead to an improved understanding of the violent star explosions that create the heavy elements in and around us.

This talk will give an overview about the experimental campaign starting from the first proof-of-principle experiment on $^{96}\text{Ru}(p,\gamma)$ [4] in 2008 to the latest proton-capture study on $^{124}\text{Xe}(p,\gamma)$ [5] in 2016. The development of the experimental setup and technique shall be reviewed in detail. Results and milestones as well as envisioned future goals will be highlighted. Finally, an outlook to future experiments at the low-energy facility CRYRING@ESR will be given.

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