

Towards background-free studies of capture reactions in a heavy-ion storage ring

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Stored and cooled highly-charged ions offer unprecedented capabilities for precision studies in the realm of atomic-, nuclear-structure and astrophysics [1]. After the successful investigation of the cross section of the $^{96}\text{Ru}(p, \gamma)^{97}\text{Rh}$ reaction in 2009 [2], the first measurement of the $^{124}\text{Xe}(p, \gamma)^{125}\text{Cs}$ reaction cross section has been performed with decelerated fully-ionized ^{124}Xe ions in 2016 at the Experimental Storage Ring (ESR) of GSI [3]. Using a Double Sided Silicon Strip Detector, introduced directly into the ultra-high vacuum environment of the storage ring, the cross sections were measured at 5 different energies between 5.5 AMeV and 8 AMeV. Elastic scattering on the H_2 gas jet target is the major source of background. Monte Carlo simulations show that an additional slit system in the ESR in combination with the energy information of the Si detector will make background free measurements of the proton-capture products possible. It will tremendously increase the sensitivity of the method.

[1] Bosch, Fritz and others, Prog. Part. Nucl. Phys. **73**, 84-140 (2013).

[2] Mei, Bo and others, Phys. Rev. **C92**, 035803 (2015).

[3] Glorius, J. and others, Phys. Rev. Lett. **122**, 092701 (2019).