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Proton-capture measurements on stored radioactive ions for the p-process nucleosynthesis

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Highly-charged stable or radioactive ions can be stored and cooled in a heavy-ion storage ring offering unrivaled capabilities for precision studies of the atomic and nuclear structure, and for astrophysics [1]. We have employed the unique feature of the Experimental Storage Ring (ESR) facility at GSI to address astrophysically relevant reactions for explosive nucleosynthesis, in
particular for the poorly understood production of the rare p-nuclei.
After the successful campaign for (p,γ) measurements on stored stable beams [2-3], within the framework of the experimental program at GSI in 2020 and 2021, the (p, γ) reaction cross-sections have been successfully measured at 10MeV/u, 7 MeV/u and 6 MeV/u beam energies using a radioactive ion beam for the first time, namely 118 Te beam with 6 days half-life. Using a Double Sided Silicon Strip Detector (DSSSD), introduced directly into the Ultra High Vacuum environment of the storage ring, the proton-capture reaction products have been detected. With the application of the newly developed "elimination of the Rutherford elastic scattering"(ERASE) technique the sensitivity for the proton-capture products is maximized.
In this contribution, the experimental method for precision studies of the proton-capture will be introduced with the highlight on the working principle of the ERASE background suppression technique. In addition, preliminary experimental results from the 118 Te(p,γ) 119 I reaction measurement will be discussed in detail.

1. F. Bosch *et al.*, Prog. Part. Nucl. Phys. **73**, 84 (2013).
2. B. Mei *et al.*, Phys. Rev. C **92**, 035803 (2015).
3. J. Glorius *et al.*, Phys. Rev. Lett. **122**, 092701 (2019).

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