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Proton capture on stored radioactive ions

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By combining two unique facilities at GSI (Helmholtz Centre for Heavy Ion Research),
the fragment separator (FRS) and the experimental storage ring (ESR), the first direct measurement of a proton capture reaction of a stored radioactive isotope has been accomplished. The combination of sharp ion energy, ultra-thin internal gas target, and the ability to adjust energy of the beam in the ring enables precise, energy-differentiated measurements of the (p,γ)-cross-sections. Our new results provide a sensitive method for measuring (p,γ) and (p,n) reactions relevant for nucleosynthesis processes in supernovae, which are among the most violent explosions in the universe and are not yet well understood.

The cross section of the ^{118}Te(p,γ) reaction was measured at energies of astrophysical interest. The heavy ions were stored with energies of 6 MeV/nucleon and 7 MeV/nucleon and interacted with a hydrogen jet target. The produced ^{119}I ions were detected with double-sided silicon strip detectors. The radiative recombination process of the fully stripped ^{118}Te ions and electrons from the hydrogen target was used as a luminosity monitor.

These measurements follow a proof-of-principle experiment which was performed in 2016 to validate the method on the stable isotope ^{124}Xe [1].
An overview of the experimental method and preliminary results from the ongoing analysis will be presented.

[1] J. Glorius et al., Phys. Rev. Lett. 122, 092701 (2019)

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