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Constraining the stellar 124Xe(p,g) rate using the ESR storage ring at GSI

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Charged-particle reactions, like (p, g) or (a, g), play a crucial role in many different astrophysical scenarios, such as the p process.
Their direct measurement is key for nucleosynthesis model predictions, but is typically hampered by very low cross sections and the lack
of intense radioactive ion beams.

In this contribution, a novel, powerful method will be presented, which aims at overcoming these limitations: we used decelerated cooled beams in the ESR storage ring at GSI to measure the 124Xe(p, g) reaction directly in inverse kinematics.
This reaction belongs to the p process flow and serves as a perfect benchmark for this method.
The stable 124Xe beam was accelerated in the UNILAC and the SIS18 to high energies of about 100 AMeV, fully stripped and injected into the ESR.
The beam was subsequently decelerated and then cooled with the electron cooler: we were thus able to push the beam energy down to the Gamow window while maintaining brilliant energy resolution.

For the first time, this enabled a reaction measurement at the astrophysically relevant energies.
In the future, this method will allow reaction studies using radioactive ion beams in or close to the Gamow window at low beam intensities and low cross sections.

This contribution will describe the technique and first results will be presented. Also, an outlook towards future studies and techniques will be given.

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