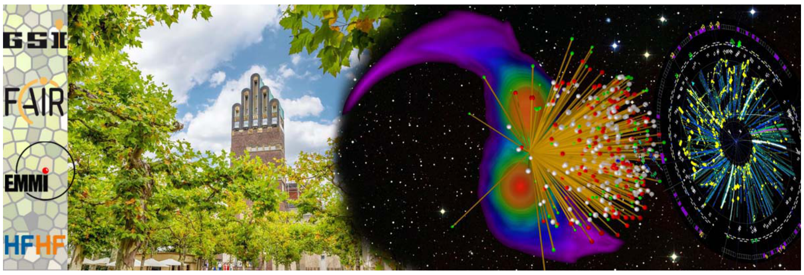

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Precise Measurement of Total Interaction Cross Sections of 12C+12C with R3B

Wednesday, 20 September 2023 10:13 (3 minutes)

The R3B (Reactions with Relativistic Radioactive ion Beams) experiment as a major instrument of the NUSTAR collaboration for the research facility FAIR in Darmstadt, enables kinematically complete measurements of reactions with high-energy radioactive beams. Part of the broad physics program of R3B is to gain a deep insight into the nuclear structure and dynamics of exotic nuclei far off stability.
A promising approach to constrain the slope parameter of the symmetry energy at saturation density is by measuring the neutron-skin thickness of neutron-rich nuclei via total reaction or total neutron-removal cross sections reactions. A direct comparison of integrated cross sections with predictions based on a realistic reaction model allows to determine the matter radius.
For a precise determination of the neutron-skin thickness, it is essential to quantify the uncertainty and challenge the reaction model under stable conditions.
The measurement of the total interaction cross sections of 12C+12C collisions at relativistic energies represents the perfect case for a direct comparison with theory.
The S444 commissioning experiment for R3B, performed in the FAIR Phase-0 campaign in 2019, was the first operation of many new R3B detectors in a common setup. During this successful commissioning, we have precisely measured the energy dependence of total interaction cross sections of a 12C beam on a 12C target, which is poorly known for energies above 400 MeV/nucleon. In my talk, I will present the results of the analysis and discuss the technique and evaluated error budget for the different steps, also applicable for exotic nuclei in the future.
(Results presented here are based on the experiment s444/s473, which was performed at the beamline infrastructure Cave-C at the GSI Helmholtzzentrum fuer Schwerionenforschung, Darmstadt (Germany) in the context of FAIR Phase-0. The project was supported by BMBF 05P21WOFN1 and 05P19WOFN1)

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