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Physics Opportunities with Relativistic Rare Ion Beams at R3B

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Since its inception, nuclear physics has used nuclear reactions to deepen our understanding of a quantum system as complex as the atomic nucleus. The arrival of the FAIR beams, in particular the improvement in the intensity delivered, and the development of state-of-the-art instrumentation, open up a wide range of possibilities for carrying out frontier experiments. R3B is a scientific collaboration of FAIR working towards the realization and exploitation of an instrument characterized by the excellent resolution and high acceptance of its detectors. Located after the Super-FRS at the end of the High Energy Branch of this facility, it will receive exotic isotopes of all chemical elements, from hydrogen to uranium, moving at energies around 1 A GeV.

Nuclear reactions induced by these projectiles, in conditions of complete and inverse kinematics, will allow us to explore the limits of the nuclear shell model, to investigate exotic (baryonic and strange) nuclear systems and to reproduce in the laboratory some relevant astrophysical scenarios as neutron stars.

In this talk we will give an overview of the scientific program of R3B, the first experimental results obtained during FAIR Phase-0 and future perspectives.

Funding Agency

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