

NUSTAR and the status of the R3B project at FAIR

O. Tengblad*¹ for the R3B collaboration²

¹Instituto de Estructura de la Materia, Consejo Superior de Investigaciones Científicas, Madrid ES-28006, SPAIN

²http://www.gsi.de/forschung/kp/kr/R3B_e.html
email: olof@iem.cfmac.csic.es

Introduction

Over the last fifteen years, reaction experiments on fixed targets using secondary beams of rather high energy have developed a potential as exploratory tool to study the properties of nuclei far from stability. NUSTAR [1], (*Nuclear Structure, Astrophysics and Reactions*) is a collaboration of the international nuclear structure and astrophysics community with the aim to further explore this method at the FAIR facility [2]. Within the FAIR complex, NUSTAR defines a facility where the heart is the Super - Fragment Separator (Super-FRS), which serves three experimental branches: The RING, the LOW- and the HIGH-ENERGY branch Fig 1.

R3B a universal setup for kinematical complete measurements

At the HIGH-ENERGY branch the fragments, emerging from the impact of the accelerated primary beam onto a production target in front of the Super-FRS, are arriving with the full velocity of the originally accelerated beam. The high energy of the primary beam makes possible the use of thicker targets and thus higher secondary beam intensities than ever before were obtained. The same goes for the secondary beams and thus makes possible experiments with more exotic species. Further, the secondary beam energies of up to 1 GeV/u that will be available with FAIR are crucial in order to limit the influence of the reaction mechanisms on the observables where nuclear structure information and the reaction mechanisms are mixed.

The R3B collaboration aims at a versatile reaction setup with high efficiency, acceptance, and resolution for kinematical complete measurements of reactions with the relativistic radioactive beams that will become available at the HIGH-ENERGY branch. The experimental configuration is based on a concept similar to the LAND reaction setup at the existing GSI, introducing substantial improvement with respect to resolution and an extended detection scheme, which comprises the additional detection of light (target-like) recoil particles and a high-resolution fragment spectrometer. The experimental setup is suitable for a wide variety of scattering experiments, such as heavy-ion induced electromagnetic excitation, knockout and breakup reactions, or light-ion (in)elastic and quasi-free scattering in inverse kinematics. The R3B set-up enables a broad physics program with rare-isotope beams to be performed.

In this contribution we will discuss the status of the NUSTAR facility with special emphasis on the R3B project. The experimental program foreseen at the HIGH-ENERGY branch will be explained using as examples recent experiments performed by the collaboration at the present LAND set-up. The status of the R&D being performed in order to develop the new detectors for R3B will be discussed.

References

[1] http://www.gsi.de/fair/experiments/NUSTAR/index_e.html

[2] http://www.gsi.de/fair/index_e.html

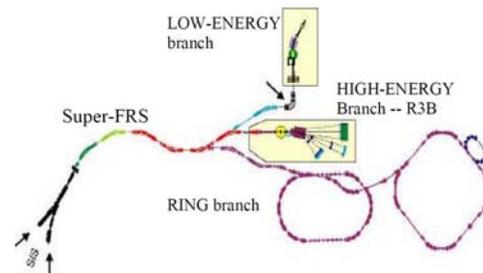


Fig. 1 The NUSTAR facility at FAIR