From Atomic Nuclei to Stars - The NUSTAR Collaboration at FAIR

The NUclear STructure, Astrophysics and Reactions (NUSTAR) Collaboration at FAIR comprises all experiments related to the study of atomic nuclei at FAIR. We conduct research using radioactive isotope beams from the FAIR facility in order to understand their properties and the underlying interactions in the nuclear medium. The final goal is to further develop and to validate different models describing atomic nuclei and their properties. These properties also play an important role in our understanding of the origin of the elements created in various astrophysical processes.

The FAIR accelerators, together with the Super Fragment Separator, will deliver very intense beams of the rarest isotopes at the highest energies world-wide. The NUSTAR collaboration is developing dedicated experimental set-ups, each optimised for the investigation of specific nuclear properties, in order to answer various scientific questions:

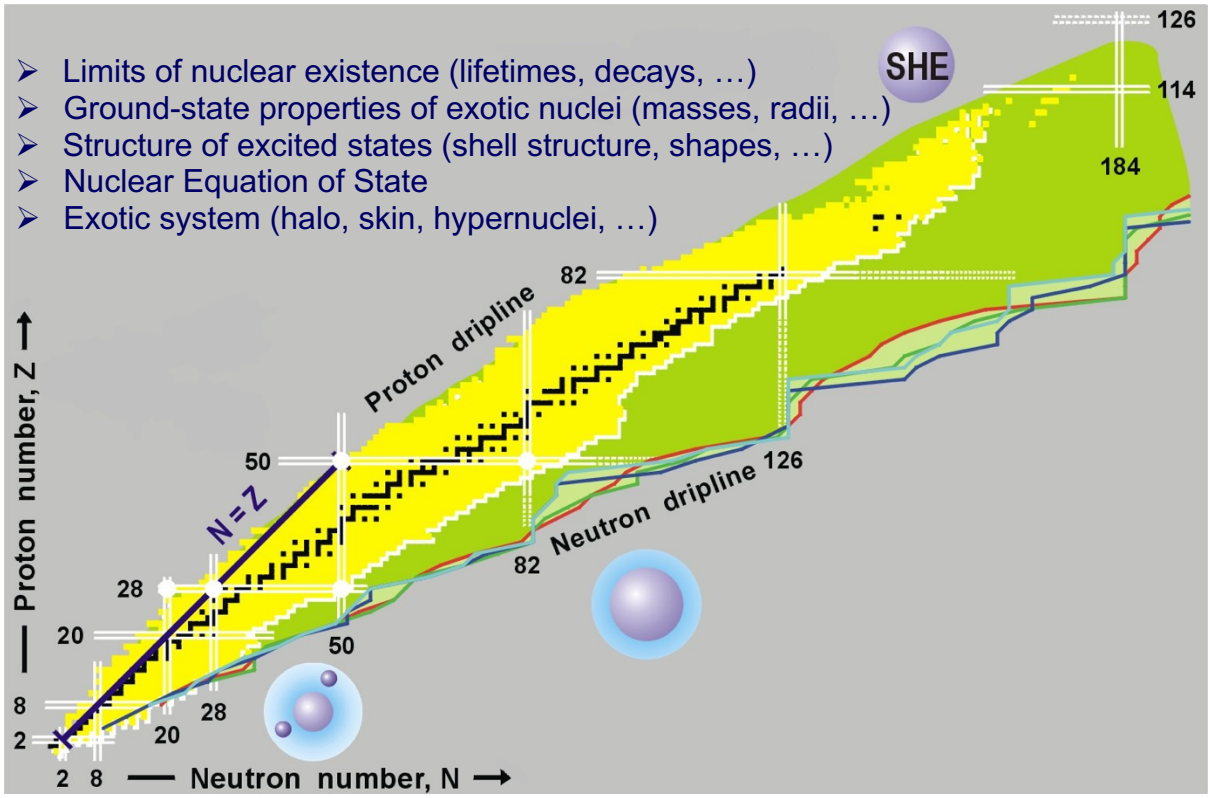

Figure 1: The chart of atomic nuclei indicating stable isotopes (black), known unstable isotopes (yellow) and particle-bound systems between the proton and neutron driplines (green). The white lines indicate particularly strongly bound ("magic") nuclei.

In this talk I will report on recently achieved milestones in the construction of the NUSTAR experiments, the first achievements in the FAIR Phase-0 program currently under way at GSI and the plans for "early physics" with the Super-FRS at FAIR from 2025. Further information about the NUSTAR Collaboration at FAIR and the individual experiments can be found at: https://fair-center.eu/user/experiments/nustar