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Status of the EXPERT project

Tuesday 26 October 2021 11:00 (20 minutes)

The experiment EXPERT (EXotic Particle Emission and Radioactivity by Tracking) is a part of the physics program of the Super-FRS Experiment Collaboration [1,2] which will be the backbone facility of the NUSTAR Collaboration of the FAIR project for research with exotic nuclei. The Super-FRS will be used for the production and transmission of separated isotopes to three experimental areas, and it can be also used as a stand-alone experimental device together with experiment-dedicated detectors.

The EXPERT experiments are aimed at studies of unknown exotic nuclear systems in the most-outer part of the nuclear landscape. The unbound nuclei will be studied by their decays in-flight by the use of tracking trajectories of the decay fragments and reconstructing their decay vertices. Two-, four- and six- proton radioactivity precursors are expected in the extremely proton-rich nuclei, whereas candidates for neutron (n) radioactivity, which has not been observed yet, will be searched in neutron-rich nuclei area in the vicinity of the dripline.

The EXPERT experiments will use the first half of the Super-FRS as a radioactive beam separator and its second half as a high-resolution spectrometer. The exotic nuclei of interest are expected to decay in flight, and outgoing fragments (i.e., precursor-like decay products) will be tracked and then identified by the spectrometer part. For this purpose, the EXPERT working group will equip the Super-FRS focal planes with dedicated particle (charged particles and neutrons) and gamma-ray detectors. Complementarily, 2p-radioactivity will be studied by using the Optical Time-Projection Chamber (OTPC) placed at the final focus of the Super-FRS. These two detection schemes of EXPERT will utilize the same radioactive beam simultaneously, and they can together cover a wide range of half-life.

The current status of detector developments, as well as physical cases, will be presented.

References

[1] J. Äystö et al., “Experimental program of the Super-FRS Collaboration at FAIR and developments of related instrumentation”, Nucl. Inst. Meth. Phys. Res. B 376 (2016) 111

[2] Super-FRS Collaboration, “Scientific program of the Super-FRS collaboration : report of the collaboration to the FAIR management”, DOI:10.15120/GR-2014-4

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