

Application of the active target technique - from nuclear to particle physics

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Active targets have been used for a variety of nuclear and particle physics experiments since many years. Most of those are ionization chambers (without gas amplification) or TPCs (with gas amplification). Active targets have been proved to be an extremely useful tool for the investigations of light-ion induced reactions using radioactive beams in inverse kinematics, in particular in the region of low momentum transfer. This technique was used for a series of scattering experiments by the IKAR collaboration between PNPI, Gatchina and GSI Darmstadt, studying the halo structure of light neutron-rich nuclei. Using the ionization chamber allowed to measure the energy of the recoil particles with the best possible precision except the EXL technique with stored beams. A few results of first and recent experiments will be given. The experimental conditions at the future international facility FAIR will provide outstanding opportunities for nuclear structure and nuclear astrophysics studies on nuclei far off stability. Two versions of active targets, dedicated for investigations at the R3B/FAIR setup within the ACTAF project, are presently under design and will be discussed. An application of the similar technique for a particle physics experiment at the MAMI accelerator (Mainz University) is an interesting example of the cross-disciplinary value of the active targets. The experiment is designed to measure recoil protons in coincidence with scattered electrons for elastic electron scattering off hydrogen, aiming an extraction of the proton radius with higher precision than it was achieved before with electron beams. The concept of the experiment, design of the high-pressure active target and the results of the first test experiment will be presented.

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