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Active targets for research on exotic nuclei

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Active targets are gaseous time-projection chambers designed for reaction and decay studies with nuclei far from stability. In reaction studies, the nuclei of the detection gas are also the targets of the reaction of interest, allowing for a large target thickness without compromising on energy resolution. This class of instruments, initially developed for high-energy physics, has found profitable applications in medium- and low-energy nuclear physics. Following the precursor IKAR detector [1], important results have been achieved in the last ten years by the Maya [2] and CENBG-TPC detectors [3].
A new generation of instruments of this kind are being developed at several facilities, to improve on crucial aspects such as maximum allowed beam intensity, efficiency, counting rates, and dynamic range of detectable signals. Many of the new devices share a purpose-built integrated electronics (GET: General Electronics for TPCs) which addresses most of the issues listed above. The advances in Micro-Pattern Gas Detectors technology is exploited through the use of Micromegas [4] and GEMs [5] as amplification devices. In some cases the active target is complemented by auxiliary systems for the detection of charged particles or gamma rays.
Thanks to their versatility, the physics scope of the new-generation active targets is broad. For direct reaction studies in inverse kinematics the advantage lies in the high luminosity. Resonant reaction measurements benefit from the detection of all kinematic parameters. A very low energy threshold for the detection of scattered particles makes them ideal instruments for the measurement of low-momentum transfer reactions, such as inelastic excitations to giant resonances.
The talk will review some of the instruments and the focus of their physics programme.

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