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Micromegas calibration for ACTAR TPC

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Active targets are gas-filled detection systems where the gas used as the detection medium serves also as a target for nuclear reactions. They have been used for a wide variety of nuclear physics experiments since the eighties. Improvements in MPGD (Micro Pattern Gaseous Detectors) and in micro electronics achieved in the last decade have led to the development of a new generation of active targets with higher granularity pad planes that allow spatial and time information to be determined with unprecedented accuracy. A novel active target and time projection chamber (ACTAR TPC with 16k channels), that will be used to study reactions and decays of exotic nuclei, is presently under development and will be based on Micromegas technology. A demonstrator version of the ACTAR TPC detection system with 2048 channels has already been constructed and is presently being tested using the GET (General Electronics for TPCs) system.

The energy resolution is of primary importance for these experiments to identify the reaction products and reconstruct precisely the level scheme of the nuclei. Energy measurements are based on the charge collected in the pixels of the pad plane. One major contribution to the energy dispersion is the non homogeneity of the Micromegas gap. A gap variation of only 1% can result in more than 2% variation in signal amplitude, which is of the same order as the resolution obtained with an energy deposition of 5 MeV. One method to calibrate the pad plane homogeneity is the use of a 2D translational scanning table equipped a radioactive source. The system we are developing will be used to quantify the gain variation for moderate size detectors up to 25x50 cm² using different types of gas and pressure adapted to the performed experiments.

In this poster, the ACTAR TPC detector will be presented. The calibration method will be explained and recent results obtained with the scanning table will be presented. Results will be compared to simulations and to other methods of calibration such as cosmic rays or pulser measurements.

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