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Alpha calibration of the Timepix pixel detector exploiting energy information gained from a common electrode signal

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An alternative calibration method of pixel detector Timepix has been developed. Unlike a standard per-pixel calibration method where just single pixel tracks of low energy gammas and fluorescence roentgens are used as an input, the new method is based on the evaluation of charge distribution within multi pixel tracks of energetic alpha particles.

The new method gets practicable if energy of interacting alpha particles is precisely known. The Timepix pixel detector allows a simultaneous run of measurement in the pixel part as well as in the common electrode when a specialized read-out interface FITPix COMBO is used. The common electrode, opposite one to the pixel electrode, provides a natural sum of energy of all affected pixels among which the particle deposited charge has been shared.

The distribution of energy between pixels belonging into alpha tracks has been evaluated and dependency between partial energy and time over threshold value counted in individual pixels has been solved. Knowing the energetical dependency, it is possible to form a matrix of calibration parameters. The method has been proved for alpha particles of regular energies. The energy resolution of the pixel detector after calibration is comparable to the resolution of common electrode signal.

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