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A method to improve the electron momentum reconstruction for the PANDA experiment

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The PANDA (AntiProton ANnihilation at DArmstadt) experiment is one of the key projects at the future Facility for Antiproton and Ion Research (FAIR), which is currently under construction at Darmstadt. This experiment will perform precise studies of antiproton-proton and antiproton-nucleus annihilation reactions. The aim of the rich experimental program is to improve our knowledge of the strong interaction and of the structure of hadrons.

In particular, the study of electromagnetic processes, like (pbar p->e+e-, pbarp->e+e-π0, etc..), gives access to the proton structure (electric and magnetic form factors, Transition Distribution Amplitudes, etc..). In such channels, the electron and positron signal needs to be separated from the hadronic background, which is six orders of magnitude larger than the signal. Excellent electron particle identification and momentum reconstruction are therefore crucial for such studies.

The PandaRoot software, based on ROOT and Virtual MonteCarlo, is used as the simulation and analysis framework for the future PANDA experiment. A Kalman Filter provides the particle momenta deduced from the central tracker, with GEANE as track follower. This method is not well suited for electrons, for which the highly non-gaussian Bremsstrahlung process yields a tail in the momentum resolution distribution.

A new method was developed to solve this problem at least partially, in an event by event procedure, taking advantage of the possible detection of the Bremsstrahlung photon as a separate cluster in the Electromagnetic Calorimeter. We will show that this is possible for tracks with transverse momentum up to 1 GeV/c. The shape of the electron shower is also used to identify the Bremsstrahlung photon at higher electron momenta region.

The improvement of electron momentum reconstruction will be shown, as well as the gain on the signal to background ratio. In the presentation, the details about the technical implementation of the method in PANDARoot will also be given.

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