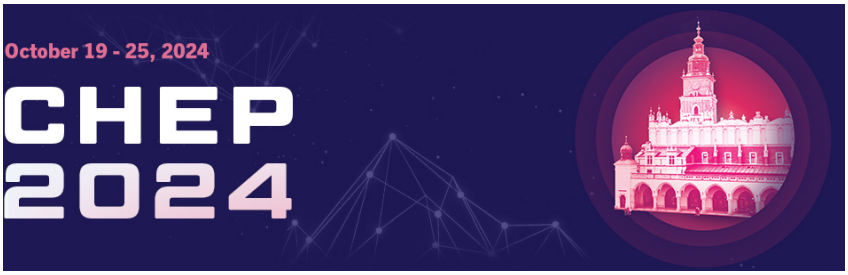

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Tracking for long-lived particles at STCF

Tuesday 22 October 2024 16:00 (15 minutes)

With an electron-positron collider operating at center-of-mass-energy 2~7 GeV and a peak luminosity above 0.5 × 10ˆ35 cmˆ−2 sˆ−1, the STCF physics program will provide an unique platform for in-depth studies of hadron structure and non-perturbative strong interaction, as well as probing physics beyond the Standard Model at the τ-Charm sector succeeding the present Being Electron-Positron Collider II (BEPCII). To fulfill the physics targets and to further maximize the physics potential at the STCF, not only the particles that decay immediately upon production but also the long-lived particles, e.g. the lambda baryon, which may decay within or outside the inner tracker hence leaving very limited number of hits at the inner tracker, should be reconstructed with good efficiency.

A Common Tracking Software (ACTS) provides a set of performant track reconstruction tools which are agnostic to the details of the detection technologies and magnetic field configuration. Due to its excellent performance, ACTS has been used as a tracking toolkit by various experiments such as ATLAS, sPHENIX, FASER etc. Preliminary results of using ACTS seeding and Combinatorial Kalman Filter algorithms for STCF have been obtained. However, it's found that the tracking performance of ACTS seeding for long-lived particles at STCF is far from satisfactory, due to the fact that the STCF inner tracker has only three layers. Therefore, improving the tracking performance of ACTS for long-lived particles at STCF by combining the global track finding algorithm Hough Transform and the local track following algorithm CKF has been investigated.

In this talk, we will present the tracking performance of ACTS for STCF, which has a tracking system with a three-layer inner tracker and a drift chamber. Improvement of the tracking performance for long-lived particles at STCF using a combined global Hough Transform and the Combinatorial Kalman Filter will be highlighted.

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