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STAR Reconstruction Improvements for Tracking with the Heavy Flavor Tracker

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The reconstruction and identification of charmed hadron decays provides an important tool for the study of heavy quark behavior in the Quark Gluon Plasma. Such measurements require high resolution to topologically identify decay daughters at vertices displaced <100 microns from the primary collision vertex, placing stringent demands on track reconstruction software. To enable these measurements at RHIC, the STAR experiment has designed and employed the Heavy Flavor Tracker (HFT). It is composed of silicon-based tracking detectors, providing four layers of high-precision position measurements which are used in combination with hits from the Time Projection Chamber (TPC) to reconstruct track candidates.

The STAR integrated tracking software (Sti) has delivered a decade of world-class physics. It was designed to leverage the discrete azimuthal symmetry of the detector and its simple radial ordering of components, permitting a flat representation of the detector geometry in terms of concentric cylinders and planes, and an approximate track propagation code. These design choices reflected a careful balancing of competing priorities, trading precision for speed in track reconstruction.

To simplify the task of integrating new detectors, tools were developed to automatically generate the Sti geometry model, tying both reconstruction and simulation to the single source AgML geometry model. The increased precision and complexity of the HFT detector required a careful reassessment of this single geometry path and implementation choices. In this paper we will discuss the tools developed to optimize track reconstruction with the HFT, our lesson learn with tracking with high precision detectors and the tradeoffs between precision, speed and ease of use which were required.

Tertiary Keyword (Optional)

Analysi tools and techniques

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