Evaluation of STAR TPC reconstruction software

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STAR is a multi purpose RHIC detector that will contribute to many of physics topics, including strangeness, high P_T, flow, spectra, deuteron, and HBT. In each physics topic, accurate measurements of charged particles are necessary. The performance of the TPC simulation and reconstruction software is very important.

At present, there are two chains for TPC simulations and analysis.The first is called fast simulation chain(tfs chain), including fast simulator(tfs), tracking(tpt), dE/dx(tid), evaluator(tte). The second is called the slow simulation chain(tss chain), including slow simulator(tss) ,hit finder(tcl), tracking, evaluator, and dE/dx. The tfs chain is well tested, and performs very well. The tss chain is being developed, so the follow results are based on the tfs chain.

We use the RQMD event generator, to generate RHIC events and then simulate the interaction between tracks and STAR detector by GSTAR. The fast simulation chain is used to simulate the detector response and tracking through the TPC.

We present here some results on the momentum resolution, dE/dx distribution, acceptance, and efficiency for the tfs chain.

Based on these plots and our study, we conclude:

1). In the central rapidity and low momentum area, the momentum resolution for pions, kaons, and protons is uniform. The average σ_p/p is 1.5%. At the edge of TPC, the momentum resolution gets worse.

2). We can't separate π and Kaon with momentum greater than 600MeV/c using TPC dE/dx alone. For Kaon/proton separation, the momentum cut is 1GeV/c.

3). The average geometric acceptance for charged particles from the primary vertex is about 88%, and the average efficiency for charged particles from the primary vertex is about 98%.

4). The tracking results from the slow simulation chain are still not as good as the results from fast simulation chain. We are working to improve it.

Based on this analysis, we conclude that STAR TPC will meet the requirements of physics analysis in STAR.

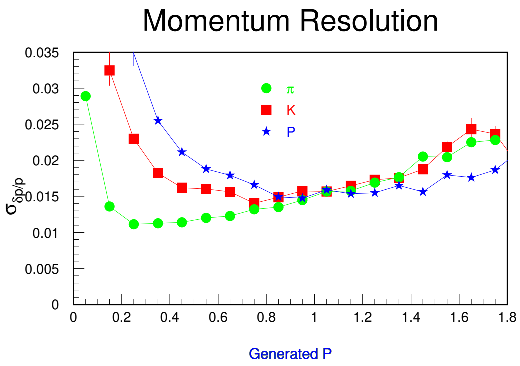

Figure 1: *momentum resolution of π, K, proton through the TPC fast simulation chain*

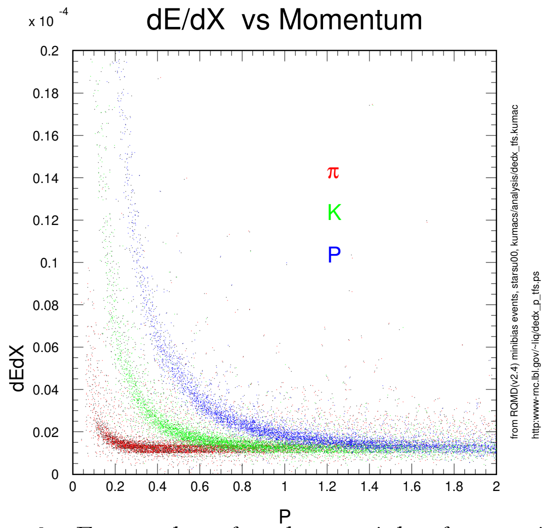

Figure 2: *Energy-loss for the particles from primary vertex through the TPC fast simulation chain*