PERSPECTIVES OF MULTISTRANGE HYPERON STUDY AT NICA/MPD FROM REALISTIC MONTE CARLO SIMULATION

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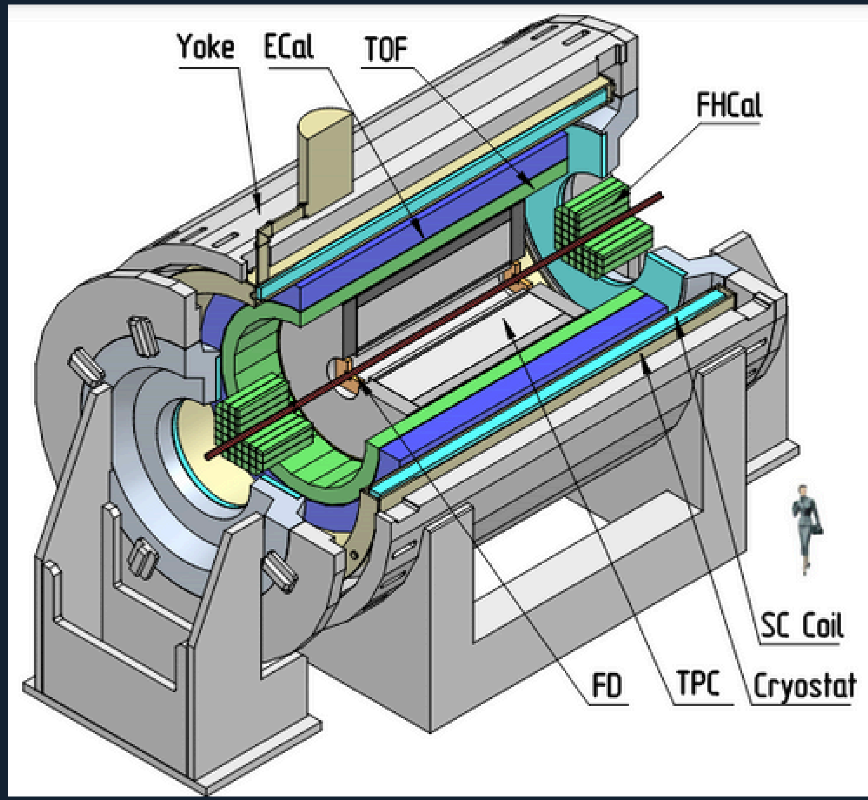
HOW IS THE INFORMATION OBTAINED?

One of the main tasks of the NICA/MPD physics program is a study of strangeness production in nuclear collisions. In this paper the MPD detector performance for measurements of multistrange hyperons in Au +Au collisions at NICA energies is presented based on the analysis of realistically simulated data samples.

- EVENT AND DATA SET GENERATION
- DETECTOR PERFORMANCE
- TRACK AND VERTEX RECONSTRUCTION
- PARTICLE IDENTIFICATION



1 EVENT AND DATA SET GENERATION

SPECIFICATIONS

Processed data sets were produced by two event generators: UrQMD and PHSD.

- The UrQMD consists of 40 thousand central (0-3.0 fm) gold + gold events at SNN =9 GeV.
- The PHSD event sample contains 8 million minimum bias Au + Au events at SNN= 11 GeV.

Used GEANT3 transport package.

2 DETECTOR PERFORMANCE

TRACK AND VERTEX RECONSTRUCTION

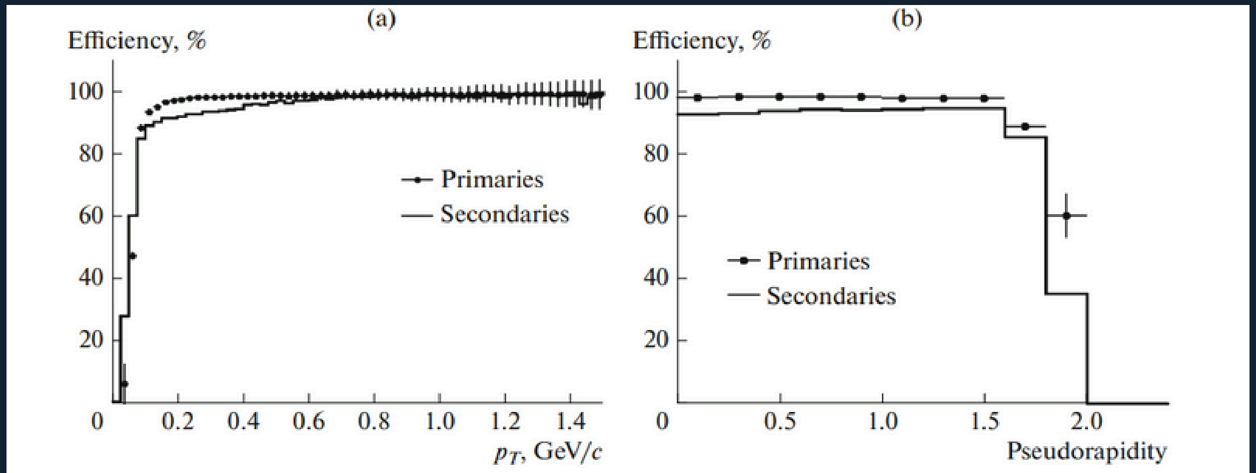


Fig. 2. Track reconstruction efficiency for particles with the number of measured points in the TPC (hits) greater than 14: (a) as a function of p_T for $|\eta| < 1.3$; (b) as a function of $|\eta|$ for $p_T > 0.1$ GeV/c. Symbols and lines present primary and secondary particles, respectively. Secondary particles were produced within 50 cm from the interaction point.

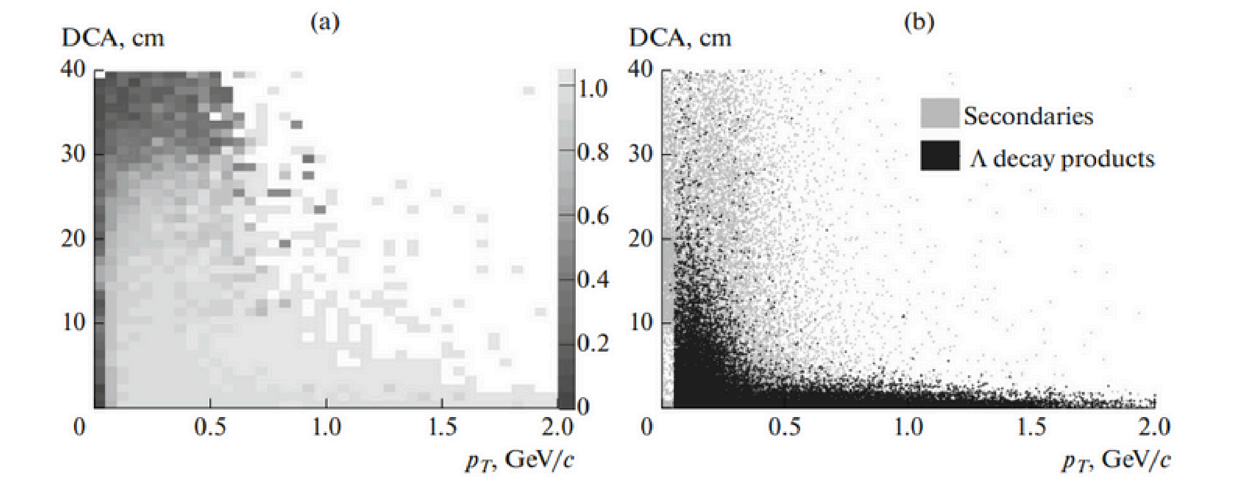
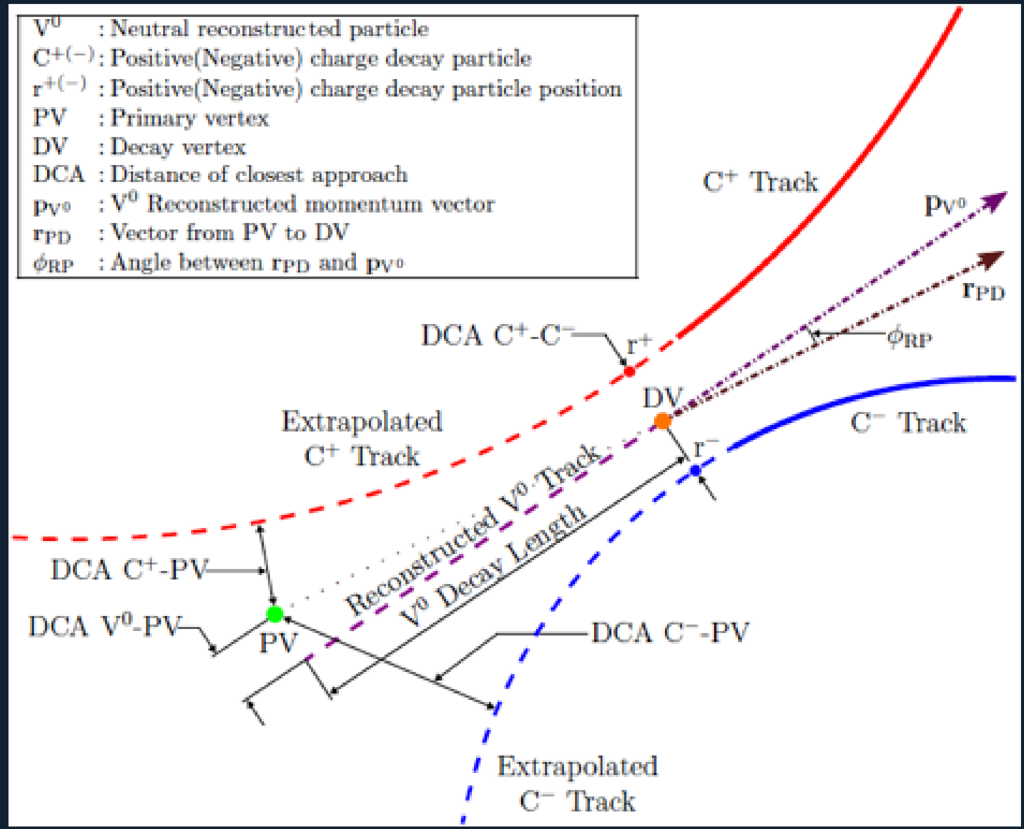


Fig. 3. (a) Secondary track reconstruction efficiency vs. DCA and p_T; (b) DCA vs. p_T for all secondary particles (grey dots) and Λ hyperon decay products (black dots).

We note that the efficiency starts to decrease for Pt below 0.6 GeV/c. Such behavior can be understood from the graph of Pt vs DCA, for large DCA values the efficiency begins to decrease.



2 DETECTOR PERFORMANCE

PARTICLE IDENTIFICATION

Particle identification in the MPD experiment will be achieved by using the information about the energy loss in the TPC gas and the time-of-flight from the TOF detector.

The matching efficiency is plotted as a function of the total momentum. The efficiency is defined as a fraction of tracks having produced a Monte Carlo point in the TOF and matched with any TOF hit.

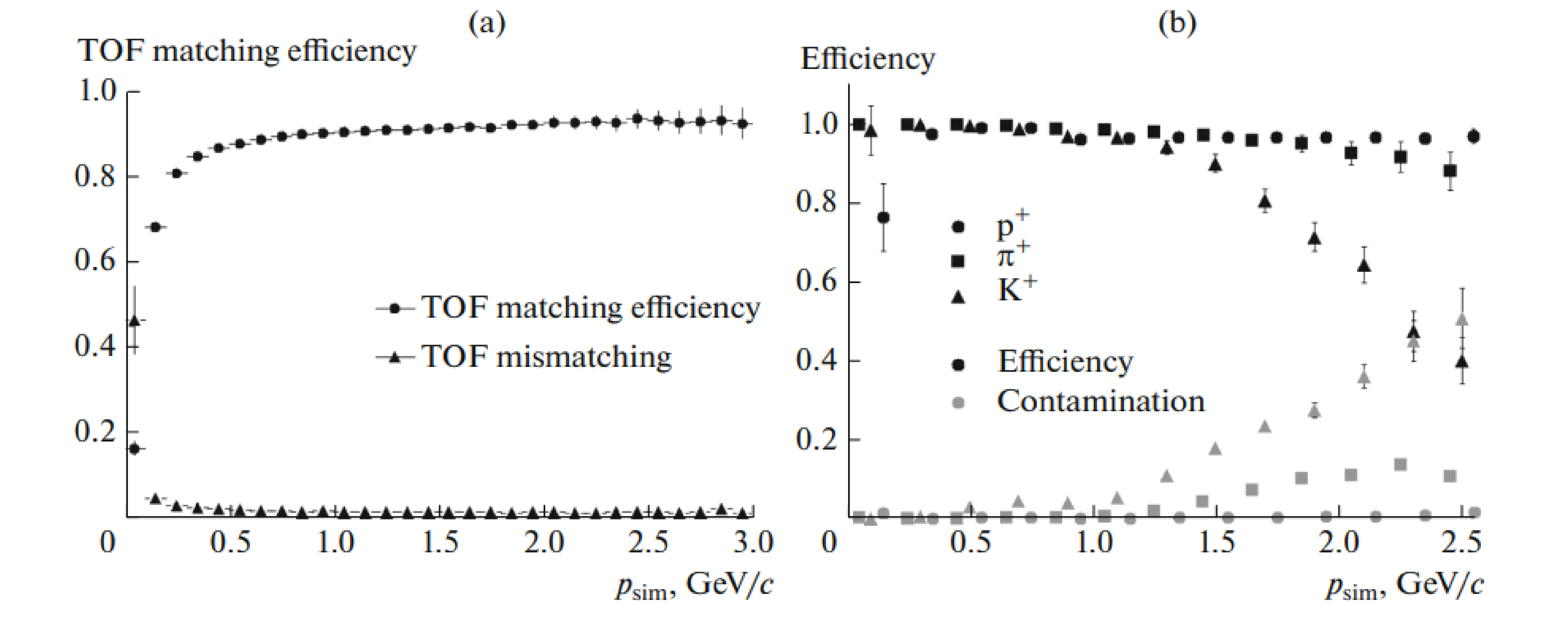


Fig. 7. (a) TOF matching efficiency; (b) Particle identification efficiency for positively charged hadrons (dark symbols) and a fraction of wrongly identified species (grey symbols) in Au + Au collisions at $\sqrt{s_{NN}}$ = 9 GeV.

With the chosen set of cuts, charged kaons can be identified up to p=1.7 GeV/c with an approximately 80% efficiency and 20% contamination at the PID limit. Making the selection criteria for kaons tighter, the achieved contamination level can be decreased further resulting in a lower value for the PID efficiency.

3 — QUESTIONS

Task 1. Primary vertex determination and Particle Track reconstruction, optimization of cuts in η, pT, number of hits on TPC.

Task 2. Particle identification determination of spectra using information about the energy losses (dE/dx) in the TPC and the Time-of-flight from the TOF detector.

Should both of us perform both tasks?

Are assigned tasks 1 and 2 similar to those mentioned above?

Should our graphs be like the ones shown above?