Event-by-Event Identified Particle Ratio Fluctuations in Pb-Pb Collisions with ALICE using the Identity Method

Mesut Arslankök for the ALICE Collaboration
Institut für Kernphysik, Goethe University, Germany

GOAL: to pin down the properties of QCD phase diagram

What to study?
- ALICE
- QGP
- Hadron Gas
- Baryochemical Potential
- Search for critical behaviour at the phase boundary

How to measure?
- A Large Ion Collider Experiment: ALICE
- Inner Tracking System (ITS) → Vertex
- Time Projection Chamber (TPC) → Tracking and Vertex
- Kinematic cuts: $|\eta| < 0.8$, $0.2 < p < 1.5$ GeV/c

What is the Challenge?
- Inner Tracking System (ITS) → Vertex
- Time Projection Chamber (TPC) → Tracking and Vertex
- Kinematic cuts: $|\eta| < 0.8$, $0.2 < p < 1.5$ GeV/c
- Misidentification: Overlap regions in the inclusive spectrum of specific energy loss (dE/dx) in TPC

Solution: Identity Method

What does it require?
- Good understanding of detector response
- Inclusive $dE/dx$ spectrum (only TPC)
- Particle Identification (PID) down to 0.2 GeV/c
- No Event-by-event fits !!!

How does it work?
- E.g.: Identification of pions
- $D_{\text{data}} = \langle W_p \rangle = \sum_x \omega_x (x) W_x$
- $\omega_x (x) = \frac{p(x)}{p(x)}$ for $p(x)$ distribution of all pions
- $W_x = \sum_x \omega_x (x)$

What do we learn?

- $\langle n_p \rangle$ Dependence
- $\langle n_p \rangle$ vs. $\langle n_K \rangle$
- $\langle n_p \rangle$ vs. $\langle p_T \rangle$

- Event-by-Event
- $\langle n_p \rangle$, $\langle n_K \rangle$: Qualitative agreement with both models.
- $\langle n_p \rangle$ vs. $\langle n_K \rangle$: Correlation in peripheral collisions not reproduced by models

- H-QM: Helmholtz Research School
- Quark Matter Studies

Quark Matter 2015, September 27 - October 3, Kobe, Japan

H-QM
Helmholtz Research School
Quark Matter Studies