Contribution ID: **88** Type: **Talk**

Nonequilibrium cumulants of the chiral order parameter and the net-proton number at lower RHIC energies

Monday, August 30, 2021 1:05 PM (25 minutes)

STAR's beam energy scan program at RHIC provides data on net-proton number fluctuations with the goal to detect the QCD critical point and first-order phase transition. Interpreting these experimental signals requires a vital understanding of the interplay of critical phenomena and the nonequilibrium dynamics of the rapidly expanding fireball. We study these aspects with a fluid dynamic expansion coupled to the explicit propagation of the chiral order parameter sigma via a Langevin equation. Assuming a sigma-proton coupling through an effective proton mass, we relate cumulants of the order parameter and the net-proton number at freeze-out and obtain observable cumulant ratios as a function of beam energy. We emphasize the role of the nonequilibrium first-order phase transition twofold: First, the presence of an unstable phase causes the well-known bending of the trajectories in the space of temperature and baryochemical potential. For these cases at lower beam energies, the system crosses the freeze-out line more than once, allowing us to calculate a wide range of cumulants for each initial condition. Second, the thermodynamic susceptibilities diverge along the spinodal lines in nonequilibrium. Depending on the freeze-out parameters, these divergences can have a dramatic impact on the calculated cumulants and cumulant ratios.

Is this abstract from experiment?

No

Name of experiment and experimental site

N/A

Is the speaker for that presentation defined?

Yes

Details

Christoph Herold, Asst. Prof., Suranaree University of Technology, Thailand, www.sut.ac.th

Internet talk

Yes

Primary authors: Prof. LIMPHIRAT, Ayut (Suranaree University of Technology); Mr SAIKHAM, Poramin (Suranaree University of Technology); HEROLD, Christoph (Suranaree University of Technology); NAHRGANG, Marlene (Subatech)

Presenter: HEROLD, Christoph (Suranaree University of Technology)

Session Classification: B Heavy Ion Collisions and Critical Phenomena