Contribution ID: **919** Type: **Oral presentation**

Measuring the speed of sound using cumulants of baryon number

Tuesday, 5 April 2022 17:50 (20 minutes)

We show that the values of the first three cumulants of the baryon number distribution can be used to calculate the isothermal speed of sound and its logarithmic derivative with respect to the baryon number density. We discuss application of this result to heavy-ion collision experiments and address possible challenges, including effects due to baryon number conservation, differences between proton and baryon cumulants, and the influence of finite number statistics on fluctuation observables in both experiment and hadronic transport simulations. In particular, we investigate the relation between quantities calculated in infinite, continuous matter and observables obtained in simulations using a finite number of particles.

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Session Classification: Parallel Session T03: QCD matter at finite temperature and density

Track Classification: QCD matter at finite temperature and density