

# Quark Matter 2019 - the XXVIIIth International Conference on Ultra-relativistic Nucleus-Nucleus Collisions



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## Study on QGP bulk property in small system

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Utilizing our developed relativistic viscous hydrodynamic code [1] to analysis of proton-lead and lead-lead collisions at the LHC [2], we investigate applicability of hydrodynamics, QGP bulk property and viscosities effects at hadronization process. Here we focus on one-particle distributions such as rapidity distributions and particle identified transverse momentum spectra and elliptic flows.

We show that relativistic viscous hydrodynamics works for explanation of experimental data of central and mid-central proton-lead collisions. Furthermore, we find that modification of particle distribution due to bulk viscosity at hadronization process affects determination of value of bulk viscosity of QGP. For example, extracted values of bulk viscosities of QGP are much smaller than those of our previous study where bulk viscosity effect at hadronization process is neglected [3].

According to our results of mean transverse momentum, effect of final state interactions in the small system is smaller than that in the large system. It indicates that produced particles in the small system keep information of the QGP fluid in high-energy heavy-ion collisions. We also discuss thermalization of systems from comparison between small and large systems.

References:

- [1] K. Okamoto and C. Nonaka, Eur. Phys. J. C 77, no. 6, 383 (2017).
- [2] J. Adam et al. [ALICE Collaboration], Nature Phys. 13 (2017) 535.
- [3] K. Okamoto and C. Nonaka, Phys. Rev. C 98 (2018) no.5, 054906.

**Author:** Mr NAKAMURA, Kouki (Nagoya University)

**Co-authors:** Mr OKAMOTO, Kazuhisa (Nagoya University); Prof. NONAKA, Chiho (Nagoya University)

**Presenter:** Mr NAKAMURA, Kouki (Nagoya University)

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