



Contribution ID: 186

Type: Poster

Constraining interactions beyond the ideal HRG model via susceptibilities of conserved charges

Wednesday, 6 April 2022 18:06 (4 minutes)

We investigate extensions of the Hadron Resonance Gas (HRG) Model beyond the ideal case by implementing both attractive and repulsive additions to the model [1]. When considering additional states exceeding those measured with high confidence by the Particle Data Group, attractive corrections to the overall pressure in the HRG model are imposed. On the other hand, we also apply excluded-volume corrections, which ensure there is no overlap of baryons by turning on repulsive (anti)baryon-(anti)baryon interactions. We see that these two extensions are complementary and focus on the agreement with first-principles lattice QCD results on fluctuations of conserved charges. We note that these results are interesting for heavy-ion-collision systems at both the LHC and RHIC. In particular, we find interesting ratios of susceptibilities that are sensitive to one correction and not the other. This allows us to constrain the excluded volume and particle spectrum effects separately. Additionally, we see that strangeness susceptibilities indicate a smaller excluded volume for hyperons than non-strange baryons.

1. J. M. Karthein, V. Koch, C. Ratti, V. Vovchenko, Phys. Rev. D, 104, 094009 (2021)

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Session Classification: Poster Session 1 T07_1

Track Classification: Correlations and fluctuations