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Influence of the latest hadronic resonances from the particle data group on thermal models, lattice QCD comparisons, and SMASH

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The number of hadron resonances used in heavy-ion collisions simulations affects both the final observables and parameters (e.g., transport coefficients) extracted from numerical simulations. This list of resonances is typically taken from the Particle Data Group (PDG) that releases a new list on approximately a yearly basis. Here we update our hadron resonance list to the PDG 2021 including all $* - * * * *$ states and make direct comparisons to lattice QCD susceptibilities and partial pressures where an improvement is seen since recently-observed particles have been included in the strange baryonic sector. Additionally, we reanalyze thermal models with this new list and extract the freeze-out temperatures. A next crucial step is to reformat our list to be compatible with SMASH such that hydrodynamic simulations can use the latest PDG list as well [1]. Before this change, SMASH has approximately half of the resonances included in the PDG 2021 list. To include these new states in SMASH we have rewritten the list that contains $1 \rightarrow 3$ and $1 \rightarrow 4$ body decays to include only $1 \rightarrow 2$ body decays and study this change on the particle spectra and mean transverse momentum. Finally, we find that the additional states improve the SMASH cross-sections, although some rescaling is required.

[1] Preliminary results: Salinas San Martin et al., Rev. Mex. Fis. Suppl. 3 (2022) 4, 040921.

Category

Theory

Collaboration (if applicable)

MUSES

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